MOSQUITO STUDIES (Diptera, Culicidae)

XII. A REVISION OF THE NEOTROPICAL SUBGENUS HOWARDINA OF AEDES[1]

By

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INTRODUCTION

The exclusively Neotropical subgenus *Howardina* has been recognized as a distinct entity in the widespread genus *Aedes* since Dyar's classification of the American species of the genus (Dyar 1920:103-106) but no attempt has been made to date to develop an internal classification of this subgenus. Nearly all species assigned to *Howardina* have been characterized entirely on the pattern of ornamentation of the adults. The immature stages were largely unknown. In recent years, considerable associated reared material has accumulated and it is now possible to attempt a comprehensive revision of the subgenus based on all stages.

The taxonomic history of *Howardina* is brief and relatively simple except for confusion with other generic group taxa (*Finlaya, Haemagogus, Stegomyia*, etc.) which need not be detailed here. *Howardina* was proposed by Theobald (1903:287) as a distinct genus with 2 included species, *walkeri* and *greenii*, and with the following definition: "Head clothed with flat and narrow curved scales, the latter forming a median area as in *Aedes*. Scutellum with narrow curved scales; the midlobe with four posterior border-bristles. Wings with lateral vein-scales large for the size of the wings, long, rather thin, the median vein-scales small. Palpi of the ♀ minute, four-jointed; the penultimate joint long, longer than the two basal ones; apical joint very minute. ♂ unknown. All small species, and with ornamented thorax." Dyar (1905:44) selected *walkeri* as the type species of *Howardina*. Coquillett (1906:312) recognized the importance of the simple claws, a character mentioned in the original description of *walkeri*. By 1910 Theobald recognized 7 species in the genus, described by himself and by Grabham, but 3 of these were subsequently removed to the genus (later subgenus) *Finlaya*. Howard, Dyar and Knab (1912a:65,70) synonymized *Howardina* with *Aedes* but Dyar (1920:103) elevated it to subgeneric rank within *Aedes* on the basis of male genitalic characters (rudimentary claspette). All other contributions between 1910 and 1932 were merely descriptions of individual species. Edwards (1932: 155-156) in his classic revision of the mosquitoes of the world listed 13 species in the subgenus *Howardina* and gave the following brief diagnosis which has been followed by all authors to the present: "most closely related to *Finlaya*, from which it differs chiefly in the simple claws of the ♀; less prominent eighth sternite of ♀ abdomen; and less developed claspette of ♂ hypopygium, the stem being very short and the appendage bristle-like. Vertex in all species with a median stripe of narrow scales reaching forward to eyes; scutellar scales narrow. Thorax conspicuously ornamented with white or golden lines. Larva.- Similar to that of *Finlaya*; a more or less distinct small chitinous plate present on each side of the ventral brush." Subsequent to Edwards' revision more confusion than progress has been accomplished, particularly in erroneous identifications of species. In the world catalog of mosquitoes (Stone, Knight and Starcke 1959:175-176) 16 species were recognized on the basis of published records.

Included in Edwards' (1932:155-156) list of species of *Howardina* were *dominicii* and *whitmorei* for which Komp (1936:71) subsequently erected the subgenus *Soperia*, with *dominicii* as the type species. Unfortunately Komp misidentified *dominicii* which in reality is conspecific with *sexlineatus* in the subgenus *Howardina*. Komp based the new subgenus primarily on the complete absence of a claspette in the male genitalia. *Soperia* has been considered as a distinct subgenus to the present and contained 3 species in the world catalog (Stone, Knight and Starcke 1959:173), one of which, *tracei*, was synonymized with *busckii* in the subgenus *Howardina* by Belkin, Schick and Heinemann (1965:33).

In the present study only the subgenus *Howardina* is recognized; the species formerly placed in *Soperia* of authors form a distinct group included in the Sexlineatus Section, 1 of 3 primary divisions of *Howardina*. A total of 35 species is now recognized in the subgenus: 5 species in 1 group in the Fulvithorax Section; 11 species in 5 groups in the Walkeri Section; and 19 species in 6 groups in the Sexlineatus Section.

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MATERIAL AND METHODS

MATERIAL. This study is based largely on extensive collections of adults and associated immature stages accumulated at the University of California, Los Angeles for the project "Mosquitoes of Middle America" (Belkin, Schick et al, 1965) and also on material from the U.S. National Museum and the British Museum (Nat. Hist.) where most of the types of previously described species are deposited. Additional critical material was obtained specifically for this study in Jamaica in November and December 1966 following the methods of collection and rearing outlined by Belkin, Hogue et al (1965).

For this revision a total of 10,949 specimens were studied, including 1,240 ♂, 3,527 ♀, 2,412 pupae, 3,770 larvae, with 1,796 individual rearings (810 pupal, 645 larval, 341 incomplete).

TAXONOMIC PROCEDURE. The taxonomic methods used in this study are the classical phylogenetic ones, simple in principle but difficult in practice. Following the recognition of species on the basis of a series of constant correlated characters in all stages, the different species were compared minutely and those showing the greatest similarities in all stages were interpreted as members of primary phyletic lines or species groups, called simply Groups here. These groups were compared in turn to establish the more inclusive Sections within the subgenus.

DESCRIPTIONS. The method of presentation, terminology and abbreviations used in the descriptions of taxa in general follow Belkin (1962). A few special terms used for the pattern of ornamentation of adults are explained in the section on taxonomic characters in the following chapter.

ILLUSTRATIONS. All available stages of every species are figured, the larvae and pupae in full and the adults in pertinent details only. Each illustration is based on a topotypic specimen, whenever available, but the character states shown represent the modal condition determined usually from at least 10 topotypic specimens. In the illustrations of the ornamentation of mesonotum and pleuron, dotted lines represent golden or creamy scales and dashed lines denote white or silvery scales.

DISTRIBUTION DATA. In the distribution lists, the arrangement of countries is from north to south and west to east and the localities in each country are listed alphabetically under the major political subdivisions. Included in these lists are all the records of material I have examined as well as published records from the literature which I consider reliable. In these lists, P and L denote whole pupa and larva and p and l, pupal and larval skins respectively.

DEPOSITORIES. The abbreviations used by Stone, Knight and Starcke (1959) for institutions in which types are deposited are followed here to indicate the location of the material studied. To these are added the Institute of Jamaica [IJ] and the Department of Zoology, Los Angeles, California [UCLA]. The bulk of the material will remain at UCLA. The types of all new species described here will be deposited in the U.S. National Museum.

GENERAL CONSIDERATIONS

TAXONOMIC CHARACTERS. The following discussion is limited to external morphological characters. Other important taxonomic characters, ecological and geographical, are discussed below in the sections on Bionomics and Distribution respectively.

In the adults, the most important taxonomic characters pertain to the pattern of ornamentation of the mesonotum. As indicated in the diagnosis of the subgenus, the pattern usually consists of lines of light scales superimposed on a background of dark scales. Each section, each group and most species have a distinctive pattern of ornamentation. It was necessary to develop a special terminology for these light lines as no suitable one was available. This terminology is illustrated in figs.8 and 9 and explained below. The *acrostichal line* is the single median longitudinal mesonotal line and is developed only in some members of the Fulvithorax Section; it ends in front of the prescutellar space and is more or less distinctly continued caudad as a pair of *lateral prescutellar lines*. The *median prescutellar line* is developed only in the Walkeri Section and is in the median longitudinal position in the "bare" prescutellar space. The *inner dorsocentral lines* are located mesad of the dorsocentral row of bristles in a submedian longitudinal position on each side; these lines reach the scutellum only in the Sexlineatus Section; the posterior parts (prescutellar) of these lines more or less correspond to the lateral prescutellar lines found in some members of the Fulvithorax Section. The *outer dorsocentral lines* are located laterad of the dorsocentral row of bristles in a sublateral longitudinal position; they are represented to a varied degree in all sections and usually reach the lateral lobes of the scutellum in the Walkeri and Sexlineatus Sections. The *lateral marginal lines* border the mesonotum on each side to a varied degree from the anterior promontory to the wing root; they may be broken into one or more prescutal and antealar segments. Transverse diagonal *posterior fossal lines* may connect the lateral marginal to the outer dorsocentral on each side. Longitudinal *supraalar lines* may also be developed and connected to the lateral marginal lines on each side caudad of the scutal angle. In *fulvithorax* and to a lesser extent in *arborealis* of the Fulvithorax Section, the ornamentation is primarily light and may be considered to have been developed by the expansion and fusion of the light lines which are discrete in the other sections, particularly in the Walkeri Section.

Other significant taxonomic features of adult ornamentation are: (1) on the *head*, scaling of the vertex and of the torus and first flagellar segment of the antenna; (2)

scaling of the *paratergite*; (3) distribution of the scales on the *pleuron*, particularly *ppn, stp* and *mep*; (4) on the *legs*, light scaling of the foretibia, midfemur and hindfemur, and the distribution and extent of light scales on the tarsal segments.

The comparatively simple male genitalia of *Howardina* show relatively few obvious taxonomic characters; even specific differences are usually subtle and sometimes not apparent. The reduced claspette is more or less characteristically developed in each section and is absent in the Whitmorei Group. Other significant taxonomic characters appear to be: (1) extent of separation of the base of the sidepieces midsternally, (2) width and length of the aedeagus in relation to the proctiger and (3) the shape of the aedeagus in dorsal aspect. Only 3 species (*bahamensis, whitmorei* and *pseudodominicii*) have genitalia strikingly differentiated from the others in features of the sidepieces.

The pupae are quite similar in the subgenus but a few characters separating the 3 sections have been noted in: (1) development of cephalothoracic hair 5-C, (2) position of abdominal hair 2-IV-VI and (3) development of abdominal hair 9-VI. On the other hand, reliable group characters within a section have not been found and specific differences are rather subtle and not always reliable.

The 4th-instar larvae show many taxonomic characters at the section and group levels usually concordant with those of adult ornamentation, and many reliable specific differences. Among the important taxonomic characters are: (1) presence or absence of marginal spicules on the anal saddle, (2) comb scales in a single row or in a patch, (3) ventral brush with 5 or 6 pairs of hairs, (4) prothoracic hair 13-P present or absent, (5) presence or absence of integumentary spicules on the thorax and/or abdomen, and (6) numerous features in the development of hairs, particularly on the head.

BIONOMICS. All members of the subgenus, as far as known, are container breeders. Immature stages have been reported from rockholes, treeholes, broken bamboo, plant parts on the ground, leaf axils of bromeliads and aroids, and flower bracts of heliconias. A few species invade artificial containers of various types. Only the Walkeri Section utilizes the full range of breeding habitats; the Fulvithorax Section is apparently restricted to treeholes and broken bamboo and the Sexlineatus Section is known to breed only in bromeliad axils.

In common with other ornamented mosquitoes, species of *Howardina* are apparently largely diurnal in activity (Bates 1944:159-170; 1949:16,61; Carpenter, Galindo and Trapido 1952:163; Trapido, Galindo and Carpenter 1955:530,537,538; Forattini 1965:401-403). To supplement the published information, I made a full 24-hour observation on the biting activity of females near Porus, Manchester, Jamaica at an elevation of approximately 1000 ft, where 4 species of *Howardina* were present. Biting-landing collections were made at hourly intervals at ground level under bromeliad laden trees. As seen in fig.7 there appear to be specific or group differences in activity since *walkeri* shows 2 definite peaks, a higher one in the morning, and members of the Aurites Group show only a moderate afternoon peak.

Although a number of species are known to bite man in forested areas, the definite altitudinal stratification of different species suggests that their natural hosts are a variety of vertebrates characteristic of a particular stratum in the forest. Members of the Quadrivittatus Group have been collected mainly in the forest canopy (Trapido and Galindo 1957:122,123,124,125,131), while members of the Fulvithorax Group are predominantly forest floor biters (Trapido and Galindo 1957:131); members of the Sexlineatus Group (Trapido and Galindo 1957:132) and Whitmorei Group (Bates 1944:166), on the other hand, demonstrate inconsistent behavior.

DISTRIBUTION (fig.1). *Howardina* is strictly a Neotropical taxon, centered in the American Mediterranean region in the sense of Belkin (1962:562). At present its known northern limit is Grand Bahama Island in the east and the Sierra Madre del Sur and the southern end of the Sierra Madre Oriental in Mexico in the west. The southern limit appears to be in northern Argentina along the Andes; the subgenus apparently does not reach the mouth of the La Plata river in the east.

The distributions of the 3 sections are largely complementary. The Walkeri Section is almost entirely confined to the islands of the Caribbean area with only a slight overlap with the other 2 in northern Venezuela and Trinidad. The Fulvithorax Section is found primarily in eastern South America but with a significant overlap with the Sexlineatus Section in southern Central America. The Sexlineatus Section is primarily associated with the mountain regions of Central America and western South America.

SYSTEMATICS AND EVOLUTION. The 35 species recognized in the present study fall into 12 largely well-defined, discrete groups of 1 or more species each. On the basis of morphological similarity the 12 groups form 3 very distinct sections in the subgenus, the Fulvithorax Section with only 1 group (Fulvithorax) of 5 species (1 not named), the Walkeri Section with 5 groups (Walkeri, Aurites, Ioliota, Albonotatus, and Busckii) of 11 species, and the Sexlineatus Section with 6 groups (Quadrivittatus, Sexlineatus, Whitmorei, Allotecnon, Eleanorae and Aurivittatus) of 19 species.

As indicated in the preceding discussions, as well as in the taxonomic treatment of each section, there is practically no overlap in diagnostic morphological characters among the 3 sections, little overlap in distribution, and strong differentiation in the breeding sites between Fulvithorax Section and the Sexlineatus Section. It appears, therefore, that the 3 sections represent 3 old phyletic lines.

In spite of this clear-cut divergence, there is a remarkable basic similarity in all stages in all 3 sections. This is undoubtedly indicative of true affinity and some kind of monophyletic origin. Two general explanations for the development of 3 major phyletic lines in *Howardina* are possible. First, would be serial or independent development of 2 of the sections from the third; this is not plausible because each of the lines has retained primitive features absent in 1 or 2 of the others. Second, would be a tripartite splitting of one ancestral species. This interpretation is supported by the present distributions of the 3 sections and I therefore suggest on this basis that the original stock was divided into 3 segments: (1) one in the Caribbean, giving rise to the Walkeri Section, (2) one in Central America, giving rise to the Sexlineatus Section, and (3) one in northeastern South America, giving rise to the Fulvithorax Section.

Subsequent speciation and evolution have followed different patterns in each section, probably because of different environmental conditions. In the Fulvithorax Section, which occupies primarily eastern South America where relatively few barriers to dispersal have existed, at least in relatively recent geological times, there has been little differentiation and speciation. The Walkeri Section shows typical complex insular speciation of a variety of divergent types, including relict forms. In the rather homogeneous Sexlineatus Section the extensive speciation reflects the barriers and environmental diversity associated with the complex orogenies of the cordilleras of western America.

AFFINITIES. The general similarity between the subgenera *Howardina* and *Finlaya* has been recognized by many culicidologists, notably Edwards (1932:156), and as indicated in the introduction, some species of *Finlaya* were originally included in *Howardina*, primarily on the basis of the ornamentation of the adults. The chief differences from *Finlaya* are the untoothed claws and less prominent sternite VIII in the females and the claspette poorly developed or completely absent in the males. In the last feature, *Howardina* shows little difference from the Oriental *dissimilis* subgroup of *Finlaya* (Knight and Marks 1952:516-517). The immature stages of *Howardina* also bear a general resemblance to those of *Finlaya* and are very similar to those of some species of the genus *Haemagogus*, which is also restricted to the Neotropical region and may have evolved from a *Finlaya* stock "through some such species as *A. (F.) leucocelaenus*" (Edwards 1932:178). The following unusual combination of features in the larvae of *Howardina* may be diagnostic for the subgenus: abdominal hair 12-I never developed, hair 9-I always ventrad of hair 7-I, and tubercles of prothoracic hairs 5-7-P usually distinctly joined (except in Fulvithorax Section).

Little can be done now to clarify the affinities of *Howardina* chiefly because the immature stages of the majority of annectent groups in the tribe Aedini are very poorly known both in the Old World and the New World. In spite of some apparent slight overlap with the subgenus *Finlaya* and the genus *Haemagogus, Howardina* is a very distinct group, and should be retained as a subgenus of *Aedes.*

MEDICAL IMPORTANCE. Little information is available on the medical importance of species of *Howardina*. A few of the more abundant species were investigated in connection with studies on the vectors of jungle yellow fever. Experimental studies with *fulvithorax* showed that while it could be infected with and maintain the virus, it was not able to transmit it naturally through bites (Davis and Shannon 1931; Whitman and Antunes 1937). Similar results were obtained with other species of *Howardina* by Boshell-Manrique and Osorno-Mesa (1944), Bugher, Boshell-Manrique et al (1944) and Aitken (1960). Bates (1949:205) has suggested that the incubation period of this virus in some mosquitoes may be a long one and it is possible that *Howardina* species may transmit the yellow fever virus if the incubation period is prolonged at favorable temperatures. Galindo (1964) reported the isolation of an unidentified virus from *quadrivittatus* in Panama. Since some species of *Howardina*, especially members of the Walkeri Section (Walkeri, Aurites and Busckii Groups), attack man readily and are very abundant, a more thorough investigation of the role of these species as vectors of arboviruses should be made.

TAXONOMIC TREATMENT

Subgenus **HOWARDINA** Theobald

1903.*Howardina* Theobald, 1903:287. TYPE SPECIES: *Culex walkeri* Theobald, 1901, Jamaica; the second of 2 included species, selection of Dyar (1905a:49).

1936.*Soperia* Komp, 1936b:71. TYPE SPECIES: *Aedes dominicii* Rangel and Romero-Sierra, 1907, Venezuela, original designation. **NEW SYNONYMY.**

Aedes (Howardina) of Dyar (1920:10); Bonne and Bonne-Wepster (1925:366); Dyar (1928:103); Shannon (1931:125); Edwards (1932:155); Gerry (1932:40); Lane (1939:98); Anduze (1941:14); Bates (1949:320); Lane (1949:255,261); Del Ponte, Castro and Garcia (1951:231,239); Lane (1953:706); Levi-Castillo (1953:40); Horsfall (1955:471); Martinez and Prosen (1955:21-22); Peyton, Galindo and Blanton (1958:95-100); Stone, Knight and Starcke (1959:173-174); Martinez, Prosen and Carcavallo (1960:25); Belkin (1962:340); Stone (1963:127); Prosen, Carcavallo and Martinez (1964:103); Forattini (1965:397-401); Cova Garcia, Sutil and Rausseo (1966a:in part; 1966b:333); Porter (1967:38); Stone (1967:208).

Aedes (Soperia) of Lane (1939:98); Anduze (1941:14); Senevet and Quievreux (1941:258); Anduze (1943:193; 1947:357); Lane (1953:700); Levi-Castillo (1953:40); Komp (1956:38); Stone, Knight and Starcke (1959:173); Forattini (1965:404,460,462); Cova Garcia, Sutil and Rausseo (1966b:338-339).

Howardina of Blanchard (1905:399,415); Dyar (1905:49); Theobald (1905:21); Theobald and Grabham (1905:7), Coquillett (1906b:16,26); Dyar and Knab (1906b:188); Theobald (1907: 21,149,214); Coquillett (1910:553); Theobald (1910:220); Surcouf and Gonzalez-Rincones (1911:102,139-141; 1912:276).

Aedes in part of Howard, Dyar and Knab (1912:65,70; 1917:613); Dyar (1918:71).

FEMALES (fig.16). Small to medium sized ornate species; usually blackish to dark brown with white, silver, creamy, yellowish or golden markings on head, thorax and abdomen and with white basal tarsal markings. *Head*: Eyes distinctly separated between antennae. Decumbent scales predominantly broad and flat; narrow scales usually largely restricted to median longitudinal light stripe of varied width running from lower end of interocular space to occiput; lower end of interocular space always with a tuft of very long outstanding narrow bristlelike striated scales; orbital line of narrow light scales, varied in width and length, frequently developed. Erect scales short, usually forked apically, restricted to occiput or extending on to the disc and sides of vertex. One pair (rarely 2) of interorbital bristles always differentiated; a single row of orbitals, upper usually 4(3-6) pairs, heavier, longer and more closely spaced than lower. Clypeus bare, deep brown to black. Proboscis slender; subequal to or distinctly longer than forefemur; entirely dark scaled; with a few basal bristles. Palpus always short, about 0.15 to 0.2 of proboscis; 5-segmented, segments 1 and 2 ankylozed, segment 5 minute; segments 1 and 5 without scales, remainder entirely or predominantly dark scaled, light scales usually restricted to apex of segment 4. Antenna distinctly shorter than or subequal to proboscis; torus dark brown to black, with light to dark scales always present, sometimes indistinct, usually restricted to mesal surface; flagellar segment 1 only slightly longer than segment 2, always with a few small scales on mesal surface; flagellar segments 2-13 usually with 6 moderate bristles in basal whorls. *Thorax*: Integument dark brown to almost black. Mesonotum usually with a background of short, narrow curved scales auburn to black in color and with a varied pattern of lines of light scales (except in *fulvithorax* and *arborealis* in which light scales predominate) as follows: (1) median acrostichal, (2) inner dorsocentral, (3) outer dorsocentral, (4) lateral marginal, (5) prescutal, (6) posterior fossal, (7) supraalar, (8) median prescutellar and (9) lateral prescutellar. Acrostichal bristles usually not developed on disc (present in *busckii*); dorsocentrals, prescutellars and supraalars always present, variously developed; 1 posterior fossal and 1 parascutellar always developed. Median scutellar lobe with 4,5 large marginal bristles and with dark broad flat scales laterally and narrow light scales in varied median longitudinal line; lateral lobe with 3-5 large marginal bristles and usually with narrow scales only. Paratergite bare or with scales. Bristles present on *apn, ppn, ppl, psp, stp, pra* and upper *mep*; lower *mep* bristles always absent; lowermost *stp* bristles distinctly ventrad of lower margin of *mep*. Pleural scaling dingy white, white or silvery; always present on *apn, ppl,* base of *pra, stp* and *mep; ppn, psp,* and *ssp* with or without scales. *Legs*: Coxae with light scales on external surface; trochanters with mesoventral light scales. White or silvery knee spots prominent on midleg and hindleg, slightly indicated on foreleg. Midfemur and hindfemur with or without distal light spot on anterior surface. Tibiae completely or predominantly dark; light scaling either as narrow lines or as patches. Tarsal white rings always basal, usually restricted to proximal segments. Claws simple on all legs but with minute spicules at base of external surface. *Wing*:

Veins usually entirely dark scaled, white scales rarely present on remigium; plume scales restricted to veins R_s, R_{2+3}, R_2, R_3 and M. *Abdomen*: Tergite I with numerous scales; laterotergite with large white or silvery scale patch. Tergites II-VII with broad basolateral silvery patches, progressively more removed from base and extending more tergally on distal segments, on VIII usually merging with its mate middorsally; basomedian tergal light scaling present or absent on II-VII. Light scaling of sternites varied.

FEMALE GENITALIA (fig.16). Deeply retracted into segment VIII, even cerci usually invisible. Segment VIII partially retracted into segment VII, apex visible, numerous scales and bristles present; tergite about 0.6 length of tergite VII; sternite about 1.4 of tergite length and about 0.8 of sternite VII. Tergite IX strongly developed, about 0.5 of tergite VIII, undivided, without bristles. Sigma joined to cowl, narrow; continuous with poorly sclerotized insula which bears 2 pairs of setae. Cowl narrow, joined to base of postgenital plate; atrial plates absent. Postgenital plate shorter than cercus, bilobed. Tergite X not developed. Cercus broad, subequal in length to tergite IX or a little longer. Spermathecae 3, 1 a little larger than others.

MALES (fig.16). Coloration usually similar to females, sometimes light scales of torus absent (*allotecnon*) and rarely proboscis with a ventral light patch (*whitmorei*); sexual dimorphism of head appendages marked. Proboscis usually longer than in females. Palpus porrect, slender, subequal to proboscis; 5-segmented, segments 4 and 5 subequal, narrowed; entirely or predominantly dark scaled, light scales restricted to lower surface of segments 4 and 5; a few short inconspicuous setae on body of segment 4 and apex of segments 3 and 5. Whorls of flagellar segments 1-12 very strongly developed, usually with about 40 or more long bristles; flagellar segment 12 and 13 elongate, 12 about 1.25 of 13; torus greatly swollen. Claws of foreleg and midleg enlarged, unequal; larger claw with a blunt submedian tooth; both claws with or without an acute basal external tooth and with external basal spicules more numerous than in females, extending on shaft. Hindclaws as in the females.

MALE GENITALIA. Segment VIII long and wide, unspecialized. Segment IX moderately to strongly developed; tergite lobes indistinct or prominent and bearing a few to many moderate to strong setae, connected middorsally by a narrow sclerotized bridge, sternite strongly developed, usually with distinct median sclerotization bearing several pairs of setae distally. Sidepiece well developed; more or less conical or subcylindrical; mesal membrane developed from base to apex; tergomesal and/or sternomesal margins rarely (Whitmorei Group) with slight median lobes; with numerous long bristles and scales laterally and ventrally, tergal surface varied. Claspette rarely completely absent (Whitmorei Group), usually very poorly developed as a small sternal basomesal lobe bearing 1 or rarely 2 thickened apical setae and sometimes a few other less differentiated setae. Clasper simple, slender; 1 apical spiniform always present. Aedeagus without teeth; varied in shape, usually large; lateral sclerotization sometimes produced as a distal horn or lobe. Proctiger strongly developed, prominent; paraproct with a simple, large, heavily sclerotized, curved apical tooth; cercal setae distinct, short.

PUPAE. *Cephalothorax*: Middorsal ridge moderate; all hairs present, variously developed; hair 6-C always smaller than and cephalad of 7-C; hairs 8,9-C always widely separated and far caudad of trumpet base. *Trumpet*: Not placed on tubercle; varied in length; index from about 3.0 to 9.0; always without tracheoid; pinna short to long. *Metanotum*: Hairs 10,11-C removed from 12-C, moderately close together. *Abdomen*: Hairs 8,10,11-II apparently usually absent; hair 5-II,III usually caudad of hair 4; hair 1 usually most mesal hair on all segments; hair 9-VIII ventral in position, near caudolateral angle or removed considerable distance cephalad; hairs 1-IX,X apparently not developed. Tergite IX strongly developed, its posterior margin smoothly rounded; cercal lobe of female projecting only a short distance beyond genital lobe. *Paddle*: Variously developed; midrib usually strongly differentiated; marginal spicules varied.

LARVAE. *Head*: Width of head capsule subequal to length or slightly greater; labrum indistinctly differentiated, very narrow; mouthbrushes very numerous, filamentous; collar well developed, narrow; ventral part of head capsule (labial plate) rather short; posterior tentorial pit near caudal border; maxillary suture complete, sometimes extending caudolaterad of pit; cephalic border of labial plate truncate; aulaeum with filamentous spicules; mental plate well developed. Hair 0-C distinct, far removed laterad of 1-C; 2-C apparently always absent; 3-C moderately developed; 11, 12,14-C sometimes stellate. *Antenna*: Short to moderate in length; shaft with or without short spicules. Hair 1-A single to 3-branched. *Thorax*: Integument glabrous or with more or less distinct spicules. Hairs 0,1,3,4,8,13,14-P, 1,13,14-M, 1,3,4,5,8, 13-T sometimes stellate. Hairs 1-3-P on common tubercle, placed close to middorsal line; tubercles of 5-7-P usually distinctly joined (except *in* Fulvithorax Section); 9-12-P far ventrad, poorly developed, none of the hairs distinctly stellate. Hair 5-T always cephalad of hair 3. *Abdomen*: Integument as on thorax. Hair 12-I never developed, 9-I always ventrad of 7-I; hairs 1,2,5,7,9,13 frequently stellate on segments I-VI; hair 6-I-VI always well developed, long; hair 7-I long. *Segment VIII:* Comb scales in a single regular row to an irregular patch of 3-5 rows. *Siphon*: Index varied from 2.0-9.0. Integument smooth, imbricate or spiculate. Pecten in a straight line, usually at least reaching to middle of siphon. Hair 1-S usually near middle; accessory hairs not developed. Acus varied or rarely absent (*walkeri*). *Anal Segment:* Saddle always incomplete; integument smooth, imbricate or spiculate; caudal margin with or without spines; acus absent. Ventral brush with 5 or 6 pairs of hairs, on a more or less distinctly sclerotized boss, with or without distinct grid bars.

DISCUSSION. For a general discussion of taxonomic characters, bionomics, distribution, systematics and affinities see the preceding chapter entitled "General Considerations."

The subgenus *Soperia* is here synonymized with *Howardina*. The taxon involved represents the Whitmorei Group of 2 species in the Sexlineatus Section, characterized primarily by the total absence of the claspette in the male genitalia. In other respects the Whitmorei Group obviously belongs in this section of *Howardina* and it is evident that there is a tendency within this subgenus to reduction in the claspette. Further, the name *Soperia* cannot be applied to the Whitmorei Group without recourse to the International Commission on Zoological Nomenclature since the nominal type species, *dominicii*, designated by Komp is a synonym of *sexlineatus* which obviously belongs to a different taxonomic group. In view of the above-mentioned taxonomic interpretation, there is no need at this time to request the Commission to vary the type species of *Soperia*, and this subgenus becomes a subjective synonym of *Howardina* by strict application of the rules in the current code.

KEYS TO SECTIONS

ADULTS

1. Prescutellar space with single median golden, yellow or silvery line; paratergite without scales . . . . **WALKERI SECTION**

Prescutellar space with paired lateral white, yellow, golden or silvery lines; paratergite with scales 2

2(1). Mesonotum with acrostichal line always dark . . **SEXLINEATUS SECTION**
Mesonotum with at least acrostichal line yellow or golden, sometimes anterior half or more of mesonotum entirely or largely yellow or golden-scaled . . . . **FULVITHORAX SECTION**

MALE GENITALIA

1. Tergal surface of sidepiece with a very dense vestiture of large bristles obscuring claspette area from dorsal aspect (*15. bahamensis*) . . . . in part **WALKERI SECTION**
Tergal surface of sidepiece with sparse vestiture of short or moderate bristles not obscuring claspette area from dorsal aspect 2

2(1). Claspette completely absent (Whitmorei Group) . . . . in part **SEXLINEATUS SECTION**
Claspette represented by more or less strongly developed sternomesal lobe or plaque bearing usually 1 thickened apical bristle, rarely 2 or more . . . 3

3(2). Sidepieces separated from each other at base sternally by a distance less than maximum width of aedeagus . . . . **SEXLINEATUS SECTION**
Sidepieces separated from each other at base sternally by a distance greater than maximum width of aedeagus 4

4(3). Claspettes connected across midline by more or less distinct sclerotized bar . . . . **FULVITHORAX SECTION**
Claspettes not connected across midline . . . . . . **WALKERI SECTION**

PUPAE

1. Hair 5-C longer than distance between its base and that of trumpet, always double; hair 2-IV-VI usually within basal 0.66 of its tergite . . . . **SEXLINEATUS SECTION**
Hair 5-C shorter than distance between its base and that of trumpet, varied in branching; hair 2-IV-VI usually distad of basal 0.75 of its tergite 2

2(1). Hair 9-VI minute, less than 0.5 of hair 2-VI . . **FULVITHORAX SECTION**
Hair 9-VI subequal to or longer than hair 2-VI . . . . **WALKERI SECTION**

LARVAE

1. Caudal border of saddle without distinct marginal spicules; comb scales always in a patch of 3 or 4 irregular rows . . **FULVITHORAX SECTION**
Caudal border of saddle with conspicuous long marginal spicules; comb scales usually in a single even row, rarely in a patch of 2-4 irregular rows (*16. busckii*) 2

2(1). Hair 13-P not developed . . . . **WALKERI SECTION**
Hair 13-P present 3

3(2). Hair 9-P poorly developed, single (Ioliota Group) . . . . in part **WALKERI SECTION**
Hair 9-P strongly developed, at least 4-branched . **SEXLINEATUS SECTION**

FULVITHORAX SECTION

FEMALES. Medium sized species, wing 2.8-3.6 mm. *Head*: Scales predominantly or entirely light, submedian and lateral dark patches sometimes large. Erect scales present on disc of vertex. Torus yellowish to dark brown, with a few moderately broad dark scales mesally. Palpus entirely dark scaled. *Thorax*: Mesonotum varying from nearly entirely golden or yellow to predominantly dark bronzy but with at least golden acrostichal line developed; median prescutellar light line not developed. Paratergite with scales. Acrostichal bristles absent on disc. Pleural scales silvery or dingy golden; *ppn, psp,* and *ssp* with scales; most of *mep* covered with large continuous scale patch. *Legs*: Midfemur and hindfemur without distinct distal light spot on anterior surface. Apex of tibia and base of tarsal segment 1 of all legs with white scales; all other tarsal segments dark. *Wing*: Veins entirely dark scaled. *Abdomen*: Sternites II-IV without dark scales.

MALES. Larger claw of foreleg and midleg with submedian tooth only.

MALE GENITALIA. Lobes of tergite IX indistinct to moderately prominent, with numerous strong setae. Sidepieces separated from each other at base by a distance greater than diameter of aedeagus at that level; tergomesal and sternomesal margins without any indication of lobes. Claspette prominent, connected at base with its mate by more or less distinct sclerotized bar; apical and subapical bristles varied in development.

PUPAE. *Cephalothorax*: Hair 5-C distinctly shorter than distance between its base and that of trumpet. *Abdomen*: Hair 5-IV,V usually single, extending beyond apex of tergite following; 2-IV-VI usually distad of 0.75 of its tergite; 9-II-VI cephalad of hair 6; 9-VII moderate to strong, close to hair 6, not removed cephalad.

LARVAE. Stellate hairs moderately developed. *Antenna*: Short; without spicules; hair 1-A single. *Thorax*: Integument glabrous; hairs 5-7-P on separate tubercles; hair 9-P usually single or double; hair 13-P absent. *Abdomen*: Integument glabrous; hairs 2,5,9-II-VII usually stellate, with few branches; hair 8-VII cephalodorsad of 9-VII. *Segment VIII*: Hair 5 stellate. Comb scales always in a patch of 3,4 irregular rows; individual scales rounded apically. *Siphon*: Index 2.2-2.3. Integument glabrous; pigmentation very strong. Acus distinct. Pecten teeth with basal denticles. *Anal Segment*: Saddle without marginal spicules. Hair 1-X short to moderate, double or triple; hair 3-X single, 2-X multiple Ventral brush with 6 pairs of hairs arising from a strongly sclerotized boss.

DISCUSSION. The Fulvithorax Section is probably the most generalized lineage in *Howardina* and is strongly differentiated in all stages from all the other sections of the subgenus. The pattern of ornamentation of the mesonotum of the adults is unique in the subgenus and shows considerable variation whereas it is stabilized in the other sections. The male genitalia are readily recognized by the widely spaced sidepieces and the relatively large prominent claspette. The larvae are immediately separated from all the other sections by the characteristic comb patch and the absence of caudal marginal spicules on the anal saddle. The pupal stage has the simplest chaetotaxy in the limited branching and the relatively small size of the more conspicuous hairs. In nearly all these characters, the Fulvithorax Section shows the closest similarity to the subgenus *Finlaya* from which *Howardina* was probably derived. Furthermore, as in typical American *Finlaya*, the natural breeding sites of the Fulvithorax Section are treeholes and broken bamboo.

The Fulvithorax Section presents a challenging taxonomic problem, which, unfortunately, I have not been able to resolve satisfactorily because of the absence of reared associated material from nearly all the critical areas of its wide reported distribution (fig.2) which is largely confined to the Atlantic drainages and extends from Nicaragua to southern Brazil. Formerly, 3 species with nearly overlapping distributions were recognized almost entirely on the basis of the extent and arrangement of the golden scaling of the mesonotum. The name *fulvithorax* was applied to forms with the mesonotum nearly entirely golden, *septemstriatus* to specimens with discrete lines of golden scales separated by dark scales, and *arborealis* to specimens intermediate in this respect. This situation suggested that only 1 very variable species was involved. However, closer analysis of the adults available for the present study and the examination of associated reared immature stages from 3 areas reveals a much more complex situation.

In the present study, I am recognizing only 1 group with 5 different forms in the Fulvithorax Section: *fulvithorax*, with a wide distribution from Venezuela and Trinidad to southern Brazil and occurring a considerable distance inland in Brazil and Peru; *septemstriatus*, restricted to lowland and moderate elevations in Nicaragua, Panama and Colombia; *arborealis*, from the Guianas and the lower Amazon; *aureolineatus*, primarily from the state of Bahia but apparently extending north to Para and south to Rio de Janeiro; and the unnamed Iquitos form from Peru which may be an inland type of *arborealis. A. fulvithorax, septemstriatus* and *arborealis* all show more or less distinct north-south clines in the extent of mesonotal golden scales, the southern populations being in general darker. In the case of *fulvithorax*, the inland populations also tend to be darker than the coastal. In any given area, only 2 of these forms appear to be present, except that 3 may occur in Para, and in all instances the different sympatric forms are quite distinct, without any intermediates. This suggests that distinct species are involved. However, the material available for this study is very limited and it is possible that the 5 forms recognized here are only subspecifically distinct and that there might be intergradations between them. It is even possible that only 1 very variable species is involved. The problem cannot be definitely resolved without progeny and individual rearings from areas of contact and overlap.

KEYS TO SPECIES

ADULTS

1. Mesonotum usually entirely golden-scaled from anterior promontory to wing root, rarely a few darker scales along dorsocentral lines posteriorly; no conspicuous dark bronzy scales on fossa . . . . *1. fulvithorax*
   Mesonotum not entirely golden-scaled in anterior portion, with at least some conspicuous dark bronzy scales on fossa, usually with a more or less conspicuous linear pattern of golden scales surrounded by dark bronzy scales 2

2(1). Central part of anterior mesonotum with at least anterior inner dorsocentral lines golden in addition to the acrostichal line 3
   Central part of anterior mesonotum with only the acrostichal line golden . 4

3(2). Lateral mesonotal light line conspicuous anteriorly, broad, not interrupted at or before scutal angle . . . . *2. septemstriatus*
Lateral mesonotal light line either completely absent or very narrow or interrupted at scutal angle . . . . *3. arborealis*

4(2). Posterior outer dorsocentral golden line distinct, linear . . *4. aureolineatus*
Posterior outer dorsocentral golden line represented by a patch caudad of scutal angle . . . . *5. Iquitos form*

MALE GENITALIA

(*5. Iquitos form* unknown)

1. Subapical seta of claspette usually less than 0.7 of length of apical, latter not reaching middle of sternomesal margin of sidepiece . . . . *1. fulvithorax; 2. septemstriatus*
Subapical seta of claspette usually subequal in length to apical, latter extending beyond level of middle of sternomesal margin of sidepiece. 2

2(1). Several subapical setae of claspette distinctly thickened . . *4. aureolineatus*
None of the subapical setae of claspette thickened . . . . . *3. arborealis*

PUPAE

(*4. aureolineatus* and *5. Iquitos form* unknown)

1. Hair 1-II usually with 4 or more branches. . *1. fulvithorax; 2. septemstriatus*
Hair 1-II usually double . . . . *3. arborealis*

LARVAE

(*4. aureolineatus* and *5. Iquitos form* unknown)

1. Hair 6-C usually double; 11-C double; most pecten teeth without basal denticles . . . . *3. arborealis*
Hair 6-C single; 11-C with more than 2 branches; all pecten teeth with basal denticles 2

2(1). Hair 0-P long, usually 14-branched (10-21); gills moderate, broad, unequal. . . . . *1. fulvithorax*
Hair 0-P short, usually 5-branched (4-6); gills long, slender and subequal. . . . . *2. septemstriatus*

1. Aedes (Howardina) fulvithorax (Lutz)

Figs.2,8,10,11

1904.*Haemagogus fulvithorax* Lutz, 1904:47,66,73. TYPE: Holotype ♀, bridge Ipe-Arcado (Goias), Brazil, date and collector not specified [LU].

1906.*Taeniorhynchus palliatus* Coquillett, 1901a:61. TYPE: Holotype ♀, Trinidad, locality and date not specified, F.W. Urich [USNM, 9140]. Synonymy with *fulvithorax* by Howard, Dyar and Knab (1917:844).

1947.*Aedes (Howardina) tachirensis* Anduze, 1947:355-357. TYPE: Holotype ♀, Las Mesas de

Seboruco, Dto. Jauregui (Tachira), Venezuela, date and collector not specified [A]. Synonymy with *fulvithorax* by Lane (1951:335).

Aedes (Howardina) fulvithorax of Bonne and Bonne-Wepster (1925:373-375); Dyar (1928:228-229); Shannon (1931a:8,23,24,25; 1931b:142,143,146,161); Edwards (1932:155); Soper, Penna et al (1933:576); Lane (1936b:186); Whitman and Antunes (1937:819-821); Lane (1939: 99); Floch and Abonnenc (1942a:5; 1942b:6); Anduze (1947:355); Lane (1951:335; 1953: 706-708); Horsfall (1955:413,471,483); Martinez and Prosen (1955:29-31); Vargas (1956:22); Stone, Knight and Starcke (1959:174); Fauran (1961:29); Prosen, Carcavallo and Martinez (1964:104); Forattini (1965:400); Cova Garcia, Sutil and Rausseo (1966a:57,285; 1966b:11, 73,141,169,333-334).

Aedes fulvithorax of Howard, Dyar and Knab (1912:65); Urich (1913:528); Howard, Dyar and Knab (1917:844-846); Dyar (1918:73,80); Costa Lima (1930:255); Davis and Shannon (1931: 716,717,718); Martini (1931:206-208); Lane (1936a:131); Causey and Kumm (1948:475,476, 477); Causey and Santos (1949:478); Causey, Kumm and Laemmert (1950:302,307); Matheson (1950:325); Delponte, Castro and Garcia (1951:239,240); Whitman (1951:263); Floch and Fauran (1954:48); Aitken (1960:4); Belem Virus Lab (1964:101,103); Bates (1949:205,320).

Gualteria fulvithorax of Theobald (1907:552); Peryassu (1908:45,179-180); Theobald (1910:607).

Haemagogus fulvithorax of Lutz (1905:67); Dyar and Knab (1906a:166,167).

Taeniorhynchus palliatus of Coquillett (1906b:24); Theobald (1910:432).

FEMALE. Wing: 2.97 mm. Proboscis: 2.34 mm. Forefemur: 2.16 mm. Abdomen: about 2.88 mm. *Head*: Scaling predominantly golden, a few dark scales present but not forming distinct lateral patches; narrow median scales occupying an extensive triangular area extending in the back to the outer erect scales and wide in front. Palpus about 0.19 of proboscis. Torus light brown to yellow, usually darkened on mesal surface. *Thorax*: Mesonotal integument yellowish to light brown; scaling usually entirely golden to just before level of prescutellar space; numerous linear dark bronzy scales along prescutellar rows, sometimes extending forward along dorsocentral bristles, a few similar dark scales in front of prescutellar space, a variable patch of similar dark scales above supraalar bristles, no dark scales on fossa; golden scales at scutal angle not markedly broadened (fig.8). Median scutellar lobe with numerous broad dark scales and a few golden in middle from base to apex; lateral lobes predominantly with narrow golden scales. Pleural scaling silvery, with slight yellowish tinge; *apn* predominantly with narrow scales, a few moderately broadened ones on lower and posterior parts; *ppn* with sparse vestiture of short linear golden scales, usually with only a few broadened scales in lower part. *Abdomen*: Median basal light patches usually present on tergites III,IV, light brown or golden; always present on V,VI, usually with slight yellowish tinge.

MALE. Wing: 2.36 mm. Proboscis: 2.1 mm. Forefemur: 1.49 mm. Essentially similar to female but lighter in color, dark scales of prescutellar area and midlobe of scutellum less numerous; *apn* with large patch of broad scales on lower posterior surface. Palpus distinctly shorter than proboscis.

MALE GENITALIA (fig.10). As figured; diagnostic characters as in the key. Ninth tergite lobe not prominent, with about 5 bristles. Claspette with subapical seta not thickened, less than 0.7 of apical, latter not reaching middle of sternomesal margin of sidepiece. Clasper with 1,2 subapical hairs.

PUPA (fig.10). Abdomen: 3.24 mm. Trumpet: 0.38 mm; index 4.5. Paddle: 0.73 mm. Chaetotaxy as figured; hairs moderately to darkly pigmented. Apparently indistinguishable from *septemstriatus* except perhaps by the longer trumpet. Readily separated from *arborealis* by hair 9-VI being minute, less than 0.5 of hair 2-VI, and more numerous branches in hairs 1-II, 9-VII,VIII. *Cephalothorax*: Mesonotum moderately pigmented between trumpets; lateral areas and metanotum slightly darker. Hair 1(1, 1-2), 2(1), 3(1), 4(2), 5(2, 1-3), 6(1), 7(2, 1-3), 8(1, 1-3), 9(1), 10(2, 2-4), 11(1), 12(2, 1-4). *Abdomen*: Tergite I deeply pigmented except for usual membranous areas; tergite II uniformly moderately pigmented; tergites and sternites III,IV with moderate pigmentation but anterior border darker; rest of segments lighter. Segment I: hair 1(10-14 primary branches, each with many secondary ones), 2(2, 1-4), 3(1), 4(4, 2-6), 5(3, 2-5), 6(1), 7(2, 1-3), 9(1), 10(1, present on majority of specimens but sometimes absent on one side). Segment II: hair 0(1), 1(7, 4-13), 2(1, 1-2), 3(1, 1-3), 4(4, 3-5), 5(1, 1-2), 6(1, 1-2), 7(1, 1-4), 9(1). Segment III: hair 0(1), 1(2, 1-4), 2(1), 3(1), 4(3, 1-4), 5(1, 1-2), 6(1), 7(3, 2-4), 8(2, 1-3), 9(1), 10(1, 1-2), 11(1), 14(1). Segment IV: hair 0(1), 1(1, 1-2), 2(1), 3(3, 1-4), 4(2, 1-3), 5(1), 6(1), 7(3, 2-3), 8(2, 2-3), 9(1), 10(1, 1-3), 11(1), 14(1). Segment V: hair 0(1), 1(1, 1-2), 2(1), 3(1, 1-2), 4(2, 1-4), 5(1), 6(1), 7(3, 2-4), 8(2, 1-3), 9(1), 10(1, 1-2), 11(1), 14(1). Segment VI: hair 0(1, 1-2), 1(1), 2(1), 3(1), 4(1, 1-2), 5(1), 6(1), 7(1, 1-2), 8(2, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(2, 1-4), 7(1), 8(2, 1-3), 9(4, 3-5), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(7, 5-8), 14(1). *Paddle*: Uniformly lightly pigmented, midrib darker; external margin slightly serrated; hair 1-P slender; male genital lobe extending to about 0.37 of paddle, female genital lobe to 0.29.

LARVA (fig.11). Head: 0.89 mm. Siphon: 0.7 mm. Anal Saddle: 0.27 mm. Both hairy and nonhairy forms known. Very similar to *septemstriatus* from which it can be separated apparently by the longer, more profusely branched hair 0-P and the broad, short unequal gills. *Head*: Pigmentation moderate except around mouthparts where it is deeper; integument smooth. Mental plate with a strong median tooth and 11(11,12) distinct teeth on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(13, 10-16), 5(1), 6(1; moderate), 7(3, 2-4), 8(1), 9(2, 1-2), 10(1), 11(12, 11-16; stellate), 12(3, 2-4), 13(1), 14(4, 3-8), 15(2, 2-4). *Antenna*: Length about 0.48 of head; pigmentation deeper than on head capsule; all hairs single; hair 1 at 0.5 from base. *Thorax*: Apices of long hairs attenuate; barbs present on long and stellate hairs. Prothorax: hair 0(14, 10-21), 1(4, 3-4), 2(1), 3(7, 4-8), 4(4, 4-9), 5(2, 2-4), 6(1), 7(3, 2-3), 8(11, 8-18), 9(2, 1-5), 10(1), 11(3, 1-4), 12(1), 14(21, 17-28). Mesothorax: hair 1(5, 3-8), 2(1), 3(1), 4(1), 5(1), 6(5, 4-6), 7(1), 8(5, 4-7), 9(5, 4-7), 10(1), 11(2, 1-3), 12(1), 13(15, 12-23), 14(9, 8-16). Metathorax: hair 1(5, 4-12), 2(1), 3(4, 3-6), 4(6, 5-13), 5(5, 4-13), 6(1), 7(5, 4-8), 8(9, 8-22), 9(4, 3-5), 10(1), 11(1, 1-2), 12(1), 13(11, 8-18). *Abdomen*: Stellate hairs with branches of unequal length. Segment I: hair 1(8, 7-13), 2(10, 4-10), 3(1), 4(6, 5-6), 5(12, 10-13), 6(4, 3-4), 7(1, 1-2), 9(6, 5-8), 10(1), 11(12, 6-13), 13(8, 5-12). Segment II: hair 0(1), 1(10, 3-11), 2(9, 6-10), 3(1), 4(5, 3-8), 5(10, 7-11), 6(3, 3-4), 7(3, 2-7), 8(1), 9(8, 5-10), 10(1), 11(1), 12(1), 13(8, 5-14). Segment III: hair 0(1), 1(4, 2-8), 2(7, 7-9), 3(1), 4(1), 5(9, 6-12), 6(2), 7(6, 5-10), 8(1), 9(9, 6-13), 10(1), 11(1), 12(1), 13(6, 4-12), 14(1). Segment IV: hair 0(1), 1(5, 2-9), 2(8, 7-9), 3(1), 4(1), 5(9, 6-11), 6(2), 7(5, 5-8), 8(1), 9(8, 7-11), 10(1), 11(1), 12(1), 13(4, 2-10), 14(1). Segment V: hair 0(1), 1(3, 2-9), 2(7, 6-9), 3(2, 1-2), 4(1), 5(6, 6-9), 6(2), 7(5, 5-8), 8(1), 9(8, 6-10), 10(1), 11(1), 12(1), 13(5, 2-11), 14(1). Segment VI: hair 0(1), 1(5, 2-10), 2(7, 6-9), 3(1), 4(1), 5(7, 4-11), 6(1, 1-2), 7(4, 3-7), 8(1, 1-2), 9(4, 4-11), 10(1), 11(1), 12(1), 13(6, 5-13), 14(1). Segment VII: hair 0(1), 1(3, 2-8), 2(7, 6-10), 3(1), 4(1), 5(4, 3-8), 6(3, 2-3), 7(1), 8(5, 4-7), 9(4, 3-6), 10(1), 11(1), 12(1), 13(4, 3-10), 14(1). *Segment VIII*: Comb scales 20(19-24), in a patch of 3 irregular rows; individual scale elongate, rounded apically and evenly fringed with short spinules; hair 0(1), 1(5, 4-10), 2(1), 3(7, 5-8), 4(1), 5(6, 5-11), 14(1). *Siphon*: Index about 2.25-2.3; darkly pigmented and with imbricate sculpturing throughout. Pecten extending to about 0.34-0.38; with 13 teeth (10-15), usually all with 1-3 basal denticles, terminal tooth not markedly enlarged. Hair 1(3, 3-4), 2(1), 3-5 not visible, 6(1), 7(1), 8(2, 1-3), 9(1). *Anal Segment*: Saddle darkly pigmented, with uniform imbricate sculpturing. Gills broad and short, unequal, ventral about 0.5 of dorsal. Hair 1(3, 2-7), 2(4, 3-5), 3(1), 4a(4, 3-5), 4b(3, 3-4), 4c(3), 4d(3, 3-4), 4e(3, 3-4), 4f(3, 2-4).

SYSTEMATICS. Adults of *fulvithorax* show considerable variation in thoracic ornamentation in different areas of the reported wide distribution of this species but are readily separated from the other species of the group by the much greater amount of golden scaling on the mesonotum in both males and females. The above descriptions of all stages are based entirely on material from Trinidad, the type locality of *palliatus*. The single specimen I have seen from Venezuela, a female paratype of *tachirensis*, is indistinguishable from the Trinidad material. In these 2 northern populations, the integument of the thorax is light yellowish tan and the mesonotal scaling is bright yellow golden without any indication of dark scales on the fossa or anterior dorsocentral lines. The Surinam specimen agrees with this description also. The French Guiana material is similar in scaling but the thoracic integument is brown. As one proceeds south along the Atlantic lowlands of Brazil (Para, Bahia and Rio de Janeiro) the mesonotal golden scaling becomes darker, more coppery and the integument tends to become darker brown; however, in all these populations the fossa is without dark bronzy scales. At higher elevations in Brazil (Sao Paulo, Goias, Matto Grosso), the darkening of the integument and scaling becomes even stronger and there is a tendency for the appearance of a few dark bronzy scales in the fossa and along the posterior dorsocentral line. The single female from Iquitos resembles the interior populations of Brazil but has more extensive dark-scaled patches on the head than any other one I have seen.

In the scanty material of immature stages available from populations other than *palliatus*, no striking differences are apparent.

No clear-cut separation can be made of *fulvithorax* from *septemstriatus* at this time in the pupal stage but the larvae of the 2 species are apparently distinct on the characters given in the key and diagnoses.

BIONOMICS. The immature stages of *fulvithorax* have been found only in treeholes. The adults are primarily diurnal in activity but a few specimens have been collected at night.

Females feed readily on experimental animals in the laboratory. They have been investigated as possible vectors of yellow fever virus (Davis and Shannon 1931; Aitken 1960). The virus will survive and apparently develop in these mosquitoes as shown by successful infection of rhesus monkeys by inoculation of experimentally infected *fulvithorax* but all attempts to transmit the virus by bite have been negative.

DISTRIBUTION (fig.2). Lowlands to moderate elevations in Venezuela (Maracaibo and Orinoco drainages), Trinidad, Guyana, Surinam, French Guiana, Brazil (Amazon, Paraguay and Parana drainages, and states of Espirito Santo and Rio de Janeiro) and Peru (Amazon drainage). Material examined: 152 specimens; 20 ♂, 62 ♀, 29 pupae, 41 larvae; 30 individual rearings (4 pupal, 20 larval, 6 incomplete).

BRAZIL. *Bahia*: Piraja, 2 Apr 1929, [C. Davis and] R.C. Shannon, 2 lp, 2 ♂, 1 ♂ genitalia, 5 L, 6 l; 1938, 1 ♂; 1 l [USNM]. *Espirito Santo*: Santa Teresa, Apr 1940, 2 ♀ (Martinez and Prosen, 1955:31; MEPRA). Valle do Chanaan, 173 ♀ (Davis and Shannon 1931:715; Whitman and Antunes 1937:819-820). *Goias*: Anapolis, Sept 1936, 1 ♂, 1 ♀ [USNM]. *Matto Grosso*: Guiaba, Feb 1935, 2 ♀; Mar 1935, 3 ♀ [USNM]. Maracaju, July 1937, 1 ♀; Nov 1937, 1 ♀; Dec 1937, 8 ♀; 3 ♀ [USNM]. Pocinho (Lane 1936b:186). *Minas Gerais*: Passos, 1945-47, 23A (Causey and Kumm

1948:475,477); 1840A (Causey, Kumm and Laemmert 1950:302,307); 386A (Causey and Santos 1949:478). *Para*: Belem, IAN forest, 105 ♀; IAN and Utinga forests, 9 ♀; Utinga forest, 9 ♀ (Belem Lab Report 1964:101,103,109,114). Belterra, June 1938, 1 ♀ [USNM]. Ilha de Marajo, 126 ♀ (Kumm and Novis 1938:502). Urucurituba, 18 Mar, C.H. Townsend, 1 ♀ [USNM]. *Rio de Janeiro*: Apr 1938, 4 ♀ [USNM]. *Sao Paulo*: Guariroba; Nhandeara; Nipoan; Planalto; Villa Poloni (Lane 1936a:131). *State not specified*: 1 ♂, 1 ♀ [USNM].

FRENCH GUIANA. Baduel (Fauran 1961:29). Balourou, Crique Anguille, Galion (Floch and Abonnenc 1947:10). Placer Isnard, June 1940, E. Abonnenc, 1 ♀ [UCLA] (Floch and Abonnenc 1947:10; Fauran 1961:29). Rorota, 8 May 1941, E. Abonnenc, 1 ♂ [UCLA] (Floch and Abonnenc 1947:10). Souvenir (Floch and Abonnenc 1947:10). Locality not specified, 1944, 1 ♂, 1 ♀ [USNM].

GUYANA. Mazaruni, 25 June 1936, 1 ♀ [USNM]; 6 July 1936, Leslie, 1 ♂ (KO 208A-1) [UCLA].

PERU. Iquitos, Mar-Apr 1931, R.C. Shannon, 1 ♀ [USNM].

SURINAM. Moengo, 19 Mar 1946, H.H. Stage, 1 L [USNM]. Locality not specified, 1 ♀ (36-69) [ITH].

TRINIDAD. *Nariva*: Charuma forest, 27 Aug 1964, treehole, A. Guerra, 1 lp♀ (TR 634-108) [UCLA]. *St. Andrew*: Mt. Harris, elev. 250 ft, 16 July 1964, treehole, F. Powdhar (TR 566), 1 lp♂ (566-102), 1 lp♀ (566-108) [UCLA]. *St. George*: Arima, Aripo Valley, elev. 500 ft, 16 Apr 1964, bamboo, A. Guerra (TR 319), 1 lp♂ (319-148), 2 lp♀ (319-139,149), 1 p♀ (319-111), 2 lP (319-128,137), 1 L; Cumaca road, elev. 500 ft, 14 Jan 1965, A. Guerra, 1 ♀ (TR 943); Verdant Vale, elev. 1000 ft, 10 Sept 1964, treehole, A. Guerra, 2 lp♀ (TR 680-102,103) [UCLA]. Monos Island, Grand Fond, 17 May 1964, treehole, A. Guerra (TR 410), 2 lp♂ (410-106,107), 1 lp♀ (410-111); 1 Aug 1964, bamboo, R. Martinez (TR 584), 1 lp♀ (584-11), 1 p♂ (584-102); 2 Aug 1964, bamboo, R. Martinez (TR 591), 1 lp♂ (591-109), 4 lp♀ (591-113,114,119,121), 1 p♂ (591-108), 1 p♀ (591-107), 1 L [UCLA]; 17 Nov 1905, F.W. Urich, 3 ♂, 1 ♀; June 1906, 2 lp♀ (20-2,3), 1 l♀ (20-1), 1 lp (20-4), 4 ♀ [USNM]. San Rafael, Arena forest, Oct 1965, 2 ♀ (TR 1432), Dec 1965, 3 ♀ (TR 1441) [UCLA]. Port of Spain, 9 Sept, 1 ♀; 1 ♀ [USNM]. *County not specified*: 26 Aug 1945, 1 lp; 9 Sept 1945, 1 ♀ [USNM].

VENEZUELA. *Bolivar*: Distrito Heres (Anduze 1947:355). Rio Orocopiche (Cova Garcia, Sutil and Rausseo 1966b:73). *Tachira*: Chururu, Distrito Uribante (Anduze 1947:357). Las Mesas de Seboruco, Distrito Jauregui, June 1944, P.J. Anduze, 1 ♀ [USNM] (Anduze 1947:357; Cova Garcia, Sutil and Rausseo 1966b:73).

2. Aedes (Howardina) septemstriatus Dyar & Knab

Figs.2,8,12,13

1907.*Aedes septemstriatus* Dyar and Knab, 1907:10. TYPE: Holotype ♀ (8), Bluefields, Nicaragua, W.F. Thornton [USNM, 10144].

Aedes (Howardina) septemstriatus of Bonne and Bonne-Wepster (1925:366-367); Dyar (1925:141, 148; 1928:232-233); Shannon (1931:142,147); Edwards (1932:155); Lane (1939:100); Floch and Abonnenc (1942a:6; 1942b:5; 1944:4; 1947:10); Martinez and Prosen (1955:27-29); Reyes (1955:74,89); Trapido, Galindo and Carpenter (1955:530,537,538); Trapido and Galindo (1957:122,125); Stone, Knight and Starcke (1959:174); Fauran (1961:29); Belkin, Schick and Heinemann (1965:42); Prosen (1965:42); Forattini (1965:239,242,403-404).

Aedes septemstriatus of Theobald (1910:485); Howard, Dyar and Knab (1917:846-847); Dyar (1918:73); Komp (1936:63); Antunes (1937a:16; 1937b:76); Arnett (1949:238); Galindo, Trapido and Carpenter (1950:102,104,105,108,112,113); Carpenter and Peyton (1952:681); Galindo, Carpenter and Trapido (1955:163); Reyes (1955:75); Komp (1956:39); Stone and Knight (1956:225); Blanton and Peyton (1958:31-32).

Aedes arborealis of Antunes (1937b:76); Reyes (1955:74,89); Boshell-Manrique and Osorno-Mesa (1944:177).

FEMALE. Wing: 3.15 mm. Proboscis: 2.53 mm. Forefemur: 2.01 mm. Abdomen: about 2.8 mm. *Head*: A large patch of broad dark scales on each side of a narrow median stripe of narrow golden scales, this stripe narrowed caudad. Palpus about 0.14 of proboscis. Torus dark brown. *Thorax* (fig.8): Mesonotal integument dark brown; mesonotum with a striking pattern of golden lines on a field of dark bronzy scales, latter sometimes with a few scattered golden scales; golden scaled lines as follows, narrow acrostichal bifurcating at prescutellar space, narrow inner dorsocentral not always reaching prescutellar space, outer dorsocentral arising at about level of scutal angle where it is broad and extending as a narrow line to scutellum; lateral marginal line broad, golden, interrupted in front of wing root, golden scales at scutal angle broader than in *fulvithorax*; fossa predominantly with dark bronzy scales, but sometimes with some scattered golden scales; space dorsad of supraalars with a large conspicuous patch of dark bronzy scales. Scutellar ornamentation as in *fulvithorax*. Pleural scaling denser and more silvery than in *fulvithorax*; scales of *apn* predominantly broad and very dense; *ppn* scale patch more extensive than in *fulvithorax* and with distinct broad scales in lower part. *Abdomen*: Median basal tergal light patches essentially as in *fulvithorax* except that scales on V,VI more silvery, without distinct yellow tinge.

MALE. Wing: 2.7 mm. Proboscis: 2.57 mm. Forefemur: 1.84 mm. Mesonotal ornamentation markedly different from female; anterior part predominantly with golden scales as in *fulvithorax* except for very narrow inconspicuous lines of dark bronzy scales on anterior dorsocentral lines and on each side of moderately broad acrostichal line, fossa usually without any bronzy scales; posterior part of mesonotum with more extensive pale scaling than in female but upper supraalar area with a distinct large patch of bronzy scales. Head with smaller dark patches than in female; palpus longer than in *fulvithorax*, subequal in length to proboscis.

MALE GENITALIA (fig.12). As figured; diagnostic characters as in the key. Extremely similar to *fulvithorax* but apparently with a more prominent IX tergite lobe with 8,9 bristles, and clasper with 2,3 longer subapical hairs.

PUPA (fig.12). Abdomen: 2.97 mm. Trumpet: 0.48 mm; index 4.3-4.5. Paddle: 0.76 mm. Only nonhairy form known. Extremely similar to and apparently indistinguishable from *fulvithorax*; separated from *arborealis* by the same characters as *fulvithorax*. Chaetotaxy as given below; hairs moderately to darkly pigmented. *Cephalothorax*: Mesonotum lightly pigmented; metanotum moderately pigmented; trumpet deeply pigmented and sharply contrasting. Hair 1(1), 2(1, 1-2), 3(1), 4(1, 1-2), 5(2, 1-3), 6(1), 7(2, 1-2), 8(1, 1-2), 9(1), 10(2, 1-3), 11(1), 12(2, 1-3). *Abdomen*: All abdominal segments lightly pigmented, first 3 segments slightly darker; anteromedian area of sternites III and IV with darker patches; integument imbricate. Segment I: hair 1(9-15 primary branches subequal in length and each with many secondary branches), 2(1), 3(1), 4(5, 2-6), 5(3, 2-5), 6(1), 7(1), 9(1), 10(1), and 11(1, found occasionally). Segment II: hair 0(1), 1(5, 2-7), 2(1), 3(1), 4(4, 2-6), 5(1, 1-2), 6(1), 7(1, 1-2), 8(1, found occasionally), 9(1). Segment III: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(2, 1-3), 5(1), 6(1), 7(3, 1-4), 8(2, 1-3), 9(1), 10(1, 1-2), 11(1), 14(1). Segment IV: hair 0(1), 1(1), 2(1), 3(2, 1-3), 4(1, 1-2), 5(1), 6(1), 7(2, 1-3), 8(2, 1-3), 9(1), 10(1, 1-2), 11(1), 14(1). Segment V: hair 0(1), 1(1), 2(1), 3(1, 1-2), 4(2, 1-3), 5(1), 6(1), 7(3, 1-4), 8(2, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(1), 7(1), 8(2, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(1, 1-2), 7(1), 8(2, 1-2), 9(3, 2-4), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(5, 4-6), 14(1). *Paddle*: Lightly pigmented, midrib slightly darker; apex not emarginated and with minute denticles; hair 1(1, 1-2). Male genital lobe extending to 0.35 of paddle, female genital lobe to 0.31.

LARVA (fig.13). Head: 0.9 mm. Siphon: 0.78 mm. Anal Saddle: 0.32 mm. Only nonhairy form known. Very similar to *fulvithorax* but apparently distinct from the latter in the short hair 0-P with few branches and gills long, slender and subequal. Chaetotaxy as given below; hairs moderately pigmented. *Head*: Pigmentation moderate except for areas around mouthparts where it is deeper. Mental plate with a strong median tooth and 12 distinct teeth (10-12) on each side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(15, 9-16), 5(1), 6(1), 7(4, 2-6), 8(1), 9(1), 10(1), 11(6, 3-7), 12(2, 1-3), 13(1), 14(2, 2-3), 15(2, 1-2). *Antenna*: Length about 0.41 of head; shaft uniform up to middle and then gradually narrowed distally; uniformly moderately pigmented, without spicules; all hairs single; hair 1 at about 0.5 from base. *Thorax*: Apices of long hairs attenuate; integument without spicules; stellate hairs with few branches. Prothorax: hair 0(5, 4-6), 1(3), 2(1), 3(3, 3-5), 4(3, 2-4), 5(3, 3-4), 6(1), 7(3, 2-3), 8(5, 5-8), 9(1, 1-2), 10(1), 11(2, 1-2), 12(1), 14(14, 10-18). Mesothorax: hair 1(3, 3-4), 2(1), 3(1), 4(1), 5(1), 6(5, 4-5), 7(1), 8(5, 5-6), 9(5, 5-7), 10(1), 11(1, 1-2), 12(1), 13(7, 3-8), 14(5, 3-5). Metathorax: hair 1(4, 3-5), 2(1), 3(3, 3-5), 4(3, 3-5), 5(5, 3-6), 6(1), 7(5, 5-7), 8(6, 4-7), 9(4, 3-5), 10(1), 11(1, 1-2), 12(1), 13(4, 3-6). *Abdomen*: Stellate hairs with fewer branches than in *fulvithorax*. Segment I: hair 1(5, 4-5), 2(6, 3-6), 3(1), 4(4, 2-8), 5(6, 5-7), 6(4, 3-4), 7(1), 9(3, 3-5), 10(1), 11(6, 5-8), 13(2, 2-5). Segment II: hair 0(1), 1(3, 2-4), 2(6, 5-8), 3(1), 4(3, 2-5), 5(5, 4-6), 6(3), 7(2, 1-3), 8(1), 9(4, 3-5), 10(1), 11(1), 12(1), 13(3, 2-5). Segment III: hair 0(1), 1(2, 1-4), 2(7, 4-7), 3(1), 4(1), 5(5, 3-5), 6(2), 7(4, 2-5), 8(1), 9(6, 4-7), 10(1), 11(1), 12(1), 13(2, 2-3), 14(1). Segment IV: hair 0(1), 1(2), 2(6, 5-8), 3(1), 4(1), 5(4, 4-6), 6(2), 7(3, 3-5), 8(1), 9(7, 4-7), 10(1), 11(1), 12(1), 13(2, 2-3), 14(1). Segment V: hair 0(1), 1(2, 1-2), 2(7, 5-8), 3(1), 4(2, 1-2), 5(5, 3-5), 6(2), 7(3, 3-4), 8(1), 9(6, 4-7), 10(1), 11(1), 12(1), 13(2, 1-3), 14(1). Segment VI: hair 0(1), 1(2), 2(6, 6-7), 3(1), 4(2, 1-2), 5(4, 3-5), 6(1, 1-2), 7(3, 3-5), 8(1), 9(4, 3-5), 10(1), 11(1), 12(1), 13(2, 2-4), 14(1). Segment VII: hair 0(1), 1(2), 2(6, 6-7), 3(1), 4(1), 5(3, 2-4), 6(2, 1-4), 7(1), 8(3, 2-5), 9(3, 3-4), 10(1), 11(1), 12(1), 13(2, 2-5), 14(1). *Segment VIII*: Comb scales usually 20(13-27), in 3 irregular rows, elongate, rounded apically and evenly fringed; hair 0(1), 1(3, 2-3), 2(1), 3(5, 4-6), 4(1), 5(4, 3-4), 14(1). *Siphon*: Index about 2.2-2.3; darkly pigmented and imbricate. Pecten extending to about 0.4; usually 15 teeth (12-15), smaller at base and gradually becoming larger distally, all with 1-3 basal denticles. Hair 1(3, 2-3), 2(1), 3-5 not visible, 6(1), 7(1), 8(2, 1-3), 9(1). *Anal Segment*: Saddle darkly pigmented and uniformly imbricate. Gills moderately long, narrow and subequal. Hair 1(2), 2(4, 3-5), 3(1), 4a(3, 3-4), 4b(2, 2-3), 4c(2, 2-3), 4d(2, 2-3), 4e(2, 2-3), 4f(2).

SYSTEMATICS. In the present interpretation, *septemstriatus* appears to be restricted to areas of rain forest, chiefly in the lowlands, in Nicaragua, Panama and Colombia. In the past it has been confused with *arborealis* and *aureolineatus* but it appears to be more closely related to *fulvithorax* on the basis of male genitalia and immature stages.

This species has a more marked sexual dimorphism in adult ornamentation than any other member of the group, the male approaching the condition in both sexes of *fulvithorax* and the female having a striking arrangement of golden and dark bronzy scales in lines on the mesonotum. In the area of overlap of the 2 forms in Colombia, *fulvithorax* and *septemstriatus* are very strongly differentiated and there is no indication of intergradation; for this reason *septemstriatus* is considered here to be a distinct species.

There is considerable variation in the ornamentation of the adults of *septemstria-*

tus but the available material is too scanty to determine whether this is entirely individual, ecological or geographical. However, it appears that in Colombia the light scaling is more restricted than in Panama and Nicaragua and particularly that the sexual dimorphism is not as marked. The above descriptions are based on individually associated material from Panama.

Although the adults of *septemstriatus* are usually readily separated from all other members of the group on the diagnostic characters in the key and descriptions, I have not been able to find any reliable characters to separate it in the pupal stage from *fulvithorax*. The larvae of the 2 species are also very similar and it is possible that some of the characters used to differentiate them are not reliable because only the nonhairy form of *septemstriatus* has been seen.

BIONOMICS. The immature stages of *septemstriatus* have been found in treeholes and broken bamboo. In one instance they were associated with 3 species of *Haemagogus, Aedes (F.) terrens*, 2 species of *Culex* and a species of *Sabethes* (Galindo, Carpenter and Trapido 1955). The adults are diurnal, primarily sylvan, and are found mainly at the forest floor and not in the canopy (Trapido, Galindo and Carpenter 1955; Trapido and Galindo 1957). Other published reports on the bionomics of *septemstriatus* (Kumm and Novis 1938; Causey and Santos 1949; Floch and Fauran 1954; Belem Virus Lab 1964) do not apply to this species and should probably be attributed to *arborealis*.

DISTRIBUTION (fig.2). Lowland to moderate elevations in Colombia (Upper Orinoco drainage), Costa Rica (Pacific side), Nicaragua (Atlantic side) and Panama (Atlantic and Pacific sides). Material examined: 151 specimens; 44 ♂, 57 ♀, 42 pupae, 8 larvae; 12 individual rearings (9 pupal, 3 larval).

COLOMBIA. *Meta*: Restrepo, 12 July 1935, W.H.W. Komp, 2 ♂ [USNM], 2 ♀ (KO 209A-9), 1 ♀ (KO 209A-11) [UCLA]; 22 July 1935, W.H.W. Komp, 9 ♂, 3 ♀, 2 l; July 1935, 1 ♂ genitalia, 1 L; 22 Aug 1935, W.H.W. Komp, 1 ♂ [USNM], 1 ♀ (KO 206A-1), 4 ♂, 8 ♀ (KO 206A-7), 1 ♂ (KO 206A-13) [UCLA]; 2 May 1942, W.H.W. Komp, 2 ♀; 1 1 [USNM]. Villavicencio, 16 July 1943, W.H.W. Komp, 1 ♀; 25 Oct 1943, M. Bates, 3 ♀; 1944, M. Bates, 1 p, 1 1 [USNM].

COSTA RICA. *Puntarenas*: Esquinas, elev. 300 ft, 6 June-30 Nov 1950, 1 A (Trapido, Galindo and Carpenter 1955:530).

NICARAGUA. Bluefields, W.F. Thornton, 2 ♀ topotypes [USNM].

PANAMA. *Bocas del Toro*: Almirante, Bocas-Chiriqui Road, 2 May 1963, A. Quinonez (PA 301), 3 lp♂ (301-106,109,112), 5 p♂ (301-102,105,108,110,111), 4 p♀ (301-101,103,104,109), 29 P. Chiriquisito, Trail Caldera, 5 Nov 1965, P. Orjuela (PA 1004), 5 ♀ [UCLA]. *Canal Zone*: Empire, 11 Feb 1926, J.B. Shropshire, 1 ♂. Fort Randolph, 27 July 1926, D.P. Curry, 1 ♂. France Field, 20 Feb 1926, J.B. Shropshire, 6 ♂, 19 ♀. Mojinga Swamp, 1 A (Blanton and Peyton 1958: 32). Paja (=Nueva Emperador), 13 May 1941, G.B. Fairchild, 5 ♂, 1 ♀. Summit, 30 May 1938, W.H.W. Komp, 1 ♀; 7 May 1943, W.H.W. Komp, 1 ♂; 15 May 1945, W.H.W. Komp, 1 ♂; 1 ♀ [USNM]. *Chiriqui*: Chorcha, elev. 300 ft, 12 June-11 Dec 1950, 1 A (Trapido, Galindo and Carpenter 1955:530). David, C.S. Ludlow, 1 ♀ (Dyar 1923:148) [Army Medical Museum]. *Cocle*: Tucue, elev. 1000 ft, 12 June-14 Dec 1950, 14 A (Trapido, Galindo and Carpenter 1955:530). *Colon*: Candelaria, elev. 200 ft, 14-27 Aug 1950, 5 A (Trapido, Galindo and Carpenter 1955:530). *Panama*: Arraijan, elev. 600-800 ft, 5 June-29 Dec 1950, 2 A. Campana, elev. 2000 ft, 14 June-6 Dec 1950, 12 A. Campanita Arriba, elev. 600 ft, 24 Aug-4 Dec 1950, 14 A. La Victoria, elev. 400-1200 ft, 7 Feb-28 Dec 1950, 1 A (Trapido, Galindo and Carpenter 1955:530). Pacora area, 10 ♀ (Galindo, Trapido and Carpenter 1950:548,551). *San Jose Island*: 26 July 1944, W.H.W. Komp, 1 ♀ [USNM].

3. Aedes (Howardina) arborealis Bonne-Wepster & Bonne

Figs.2,8,14,15

1920.*Aedes arborealis* Bonne-Wepster and Bonne, 1920:178. TYPE: Lectotype ♂ (3893) with associated larval and pupal skins (M 53) and genitalia slide (M 41), both slides marked BB 655, Dam, Surinam, Jan 1919, J. Bonne-Wepster and C. Bonne [ITH; selection of Belkin 1968].

Aedes (Howardina) arborealis of Bonne and Bonne-Wepster (1925:377-380); Dyar (1928:231-232); Edwards (1932:155); Lane (1936b:186; 1939:99); Floch and Abonnenc (1944:41; 1947:10); Lane (1953:708-710); Horsfall (1955:471); Stone, Knight and Starcke (1959:173); Floch and Fauran (1954:48); Fauran (1961:29); Belkin, Schick and Heinemann (1965:63); Forattini (1965:400); Stone (1967:208).

Aedes septemstriatus of Kumm and Novis (1938:502,507,510-511); Causey and Santos (1949:478); Floch and Fauran (1947:10; 1954:48); Fauran (1961:29); Belem Virus Lab (1964:101, 103,109,112).

FEMALE. Wing: 2.8 mm. Proboscis: 2.45 mm. Forefemur: 1.93 mm. Abdomen: about 2.63 mm. In most respects intermediate between *fulvithorax* and *septemstriatus* but differing from both in the following. *Head*: Median line of golden scales very narrow, these scales linear; submedian dark patches distinct but smaller than in *septemstriatus. Thorax* (fig.8): Mesonotum predominantly with golden yellow scales anteriorly; ornamentation superficially very similar to ♀ of *septemstriatus* except that golden acrostichal line narrower, fossa predominantly with bronzy scales, and marginal golden area interrupted in front as well as caudad of scutal angle; caudal part of mesonotum with dark scaling more extensive than golden; upper supraalar patch of dark scales conspicuous. Scutellum with a conspicuous median line of golden scales. Scales of *apn, ppn,* and *ppl* golden, remaining pleural scales silvery; *apn* with numerous dense broad scales; *ppn* patch restricted, without broad scales. *Abdomen*: Median basal tergal patches as in *septemstriatus* on VI,VII but apparently small and yellowish on IV,V.

MALE. Wing: 2.8 mm. Proboscis: 2.62 mm. Forefemur: 1.75 mm. Mesonotal ornamentation essentially as in the female but golden scales more numerous; acrostichal golden line broad; paraacrostichal dark-scaled line very narrow; outer dorsocentral dark line evident only posteriorly; fossa with small patch of dark bronzy scales; lower part of *ppn* with a few broad scales. *Head*: Without distinct dark patches, with only a few dark scales. Palpus subequal to proboscis in length, with numerous pale scales on lower basal surfaces of segments 3 to 5.

MALE GENITALIA (fig.14). As figured; diagnostic characters as in the key. In general similar to *fulvithorax* except for the following. Ninth tergite lobe indistinct, with 6,7 strong bristles. Claspette with subapical seta subequal to apical but not markedly thickened; other setae much longer than in *fulvithorax*, apical seta extending beyond middle of sternomesal margin of sidepiece. Clasper with about 5 setae in distal half.

PUPA (fig.14). Abdomen: 3.24 mm. Trumpet: 0.44 mm; index 3.3-3.4. Paddle: 0.65 mm. Only nonhairy form known. Readily differentiated from *fulvithorax* and *septemstriatus* by fewer branches in hairs 1-II, 9-VII,VIII and broader paddle. Chaetotaxy as given below; hairs moderately to darkly pigmented. *Cephalothorax*: Mesonotum between trumpets moderately pigmented, darker laterad; metanotum moderately pigmented; trumpets darkly pigmented and strongly contrasting. Hair 1(1), 2(1), 3(1), 4(1, 1-2), 5(1, 1-2), 6(1, 1-2), 7(1, 1-2), 8(2, 2-3), 9(1), 10(2), 11(1), 12(1). *Abdomen*: Tergite I moderately pigmented except for usual light membranous areas; other segments moderately pigmented and integument imbricate; pigmentation progressively lighter caudad. Segment I: hair 1(5-7 main branches, subequal in length and each with many secondary branches), 2(1), 3(1), 4(2, 2-4), 5(1), 6(1), 7(1, 1-2), 9(1). Segment II: hair 0(1), 1(2, 1-4), 2(1, 1-2), 3(1), 4(4, 1-4), 5(1), 6(1), 7(1, 1-2), 9(1). Segment III: hair 0(1), 1(1), 2(1), 3(1, 1-2), 4(1, 1-3), 5(1), 6(1), 7(2, 1-4), 8(2, 1-2), 9(1), 10(1, 1-2), 11(1, 1-2), 14(1). Segment IV: hair 0(1), 1(1), 2(1), 3(2, 2-3), 4(1, 1-3), 5(1), 6(1), 7(1, 1-2), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(1), 2(1), 3(1), 4(2, 1-3), 5(1), 6(1), 7(1, 1-2), 8(2, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(1), 7(1), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(1), 7(1), 8(1), 9(2, 1-2), 10(1), 11(1), 14(1). *Segment VIII*: hair 0(1), 4(1), 9(3), 14(1). *Paddle*: Ovoid; lightly pigmented, midrib dark; apex slightly produced; hair 1 single; male genital lobe extending to 0.6 of paddle, female genital lobe to 0.34.

LARVA (fig.15). Only nonhairy form known. Readily differentiated from *fulvithorax* and *septemstriatus* by the following. Head hairs 6,11-C usually double; stellate hairs with heavier spikes; comb scales usually more numerous (27-39), in 4,5 rows, siphon index about 2.0; 10-11 pecten teeth without basal denticles, the distal teeth greatly elongate; anal gills shorter than saddle, broad and subequal.

SYSTEMATICS. As indicated in the diagnosis above, *arborealis* is somewhat intermediate between *fulvithorax* and *septemstriatus* in the ornamentation of the adults. Its larva and pupa are quite distinct from these species but may be similar to the unknown immature stages of *aureolineatus* which appears to be closely related to *arborealis*.

In the present interpretation, *arborealis* has a more restricted distribution than formerly reported, being confined to the Guianas and the lower Amazon. Former reports of *arborealis* from Colombia pertain to *septemstriatus* and all the specimens from the lower Amazon identified as *septemstriatus* in USNM appear to be *arborealis*.

The above descriptions are based on the type series from Surinam. Specimens from Guyana and French Guiana agree in all respects with the Surinam material. The adults from the lower Amazon are usually considerably darker, with more extensive dark bronzy scaling on the mesonotum, but there is a great deal of variation in this character and some specimens are indistinguishable from the material from French Guiana. I consider all these populations as members of a single species.

A single specimen of *aureolineatus* from Para without specified locality, suggests that this species and *arborealis* may overlap in the lower Amazon but there is no indication of intergradation of the 2 forms in the material at hand from Belem and upriver.

BIONOMICS. The immature stages of *arborealis* have been found in treeholes only. There are no published reports on the adult bionomics of *arborealis* but the records of *septemstriatus* taken on human bait (Belem Virus Lab 1964) and during the wet (Oct-Mar) and dry seasons (Causey and Santos 1949) undoubtedly refer to *arborealis* in the present sense.

DISTRIBUTION (fig.2). Confined to low elevations in Guyana, Surinam, French Guiana and Brazil (lower Amazon drainage). Material examined: 80 specimens; 8 ♂, 57 ♀, 6 pupae, 9 larvae; 7 individual rearings (3 larval, 4 incomplete).

BRAZIL. *Para*: Belem, July 1931, R.C. Shannon, 1 ♀ [USNM]; IAN Forest, 413 ♀; IAN and Utinga forests, 18 ♀; Utinga Forest, 107 ♀ (Belem Lab Report 1964:101,103,109,112). Curralinho, 1 Apr 1936, 1 ♀; Apr 1936, 1 ♀; 26 July 1936, 1 ♂, 1 ♀; 1936, 1 L; 2 ♀ (K 325,341); Mar 1938, 5 ♀ [USNM]. Ilha de Marajo, 1 ♀ (Kumm and Novis 1938:507). Santarem, Belterra, Aug 1938, 1 ♀; Oct 1938, 1 ♀ [USNM].

FRENCH GUIANA. Baduel (Floch and Abonnenc 1944:4; 1947:10). Cayenne, Apr 1943, 1 ♀ [USNM]; June 1944, E. Abonnenc, 32 ♀. Cabassou, 4 Feb 1965, T.H.G. Aitken, R. Martinez and A. Guerra (FG 46), 1 ♂ [UCLA]. Iracoubo (Fauran 1961:29). Placer Isnard, 17 June 1940, E. Abonnenc, 2 ♀ [UCLA]. Rorota, 8 May 1941, 2 ♀, 3 lp (577,578) [USNM].

GUYANA. Mazaruni, 25 June 1936, W.H.W. Komp, 2 ♀ [USNM]; 6 July 1936, Leslie, 1 ♂, 2 ♀ (KO 208A-7); 6 July, 1 ♂ (KO 208A-8); 1 ♂ (KO 208A-10) [UCLA].

SURINAM. Aloesoebanja, 17 Jan 1956, E. van der Kuyp, 1 L. Dam, 1 lp♀, "cotype" [USNM, No.22712]; 1 lp♀ (39-09, "cotype"), 1 lp (39-01); 1 ♂ (38-98, "cotype") [UCLA].

4. Aedes (Howardina) aureolineatus Berlin, n.sp.

Figs.2,8,58

TYPES: Holotype ♀, Piraja (Bahia), Brazil, May 1931, Servico Febre Amarela, M.E.S., Brasil [USNM]. Allotype ♂ (660121-10) with genitalia slide, same data as holotype [USNM]. Paratypes: 2 ♀, same data as holotype [USNM, UCLA].

FEMALE. Wing: 3.6 mm. Proboscis: 2.7 mm. Forefemur: 2.32 mm. Abdomen: about 3.33 mm. *Head*: Median line of golden scales very narrow; these scales broader than in *fulvithorax* and curved; submedian dark patch very large, extending to occiput; a small elongate lateral dark line at level of middle of *apn*. Palpus about 0.19 of proboscis. Torus light yellowish brown, darkened on mesal surface. *Thorax* (fig.8): Mesonotal integument brown; scaling predominantly dark bronzy; a conspicuous acrostichal golden line from anterior promontory, bifurcating on prescutellar space and reaching scutellum; a golden outer dorsocentral line arising caudad of scutal angle, broad and curved outward anteriorly, narrow posteriorly and reaching scutellum; lateral margin golden scaled, broadly to level of middle of *ppn*, narrowly to scutal angle, broadly caudad of scutal angle, separated by dark scales from a very large golden patch in and above supraalars; a few scattered golden scales laterad of acrostichal line especially in front. Scutellum with a conspicuous median line of narrow golden scales. Paratergite as in *fulvithorax*. Scales of *apn* numerous, light golden, moderately broad and curved; *ppn* patch extensive, light golden, scales short and curved; remaining pleural scale patches silvery to very light golden. *Abdomen*: Median basal tergal light patches silvery on VI,VII, light brown on V, usually absent on other segments.

MALE. Wing: 3.06 mm. Proboscis: 3.1 mm. Forefemur: 2.16 mm. Allotype lacking proboscis, 1 antenna, palpi and all legs on right side; description from Salvador specimen. Essentially similar to female except that scattered golden scales more numerous and lateral marginal light line wider on mesonotum. Palpus subequal to proboscis in length.

MALE GENITALIA (fig.58). As figured; diagnostic characters as in the key. Essentially as in *arborealis* except that lobe of tergite IX more prominent and several setae of the claspette distinctly thickened.

IMMATURE STAGES. Unknown.

SYSTEMATICS. The adults of *aureolineatus* are strikingly different from all other members of the group except *sp. 5 (Iquitos form)* in the reduction of the golden scaling on the central anterior part of the mesonotum to a narrow acrostichal line. This form appears to be a distinct species probably related to *arborealis*, but this cannot be definitely determined until the immature stages are found.

In the small series of *aureolineatus* very little individual variation is evident. The specimens from Para and Rio de Janeiro are not significantly different from the type material from Bahia.

BIONOMICS. Nothing is known of the breeding sites and adult bionomics of *aureolineatus* but it is likely that they are similar to other members of this group.

DISTRIBUTION (fig.2). Confined to low elevations in Brazil along the coast from Para to Rio de Janeiro.

BRAZIL. *Bahia*: Piraja, May 1933, 1 ♂, 3 ♀, type series [USNM, UCLA]. Salvador, 27 Apr 1936, E. Silva, 1 ♂ [USNM]. *Para*: Apr 1930, N.C. Davis, 1 ♀ [USNM]. *Rio de Janeiro*: Apr 1933, 1 ♀ [USNM].

5. Aedes (Howardina) sp., Iquitos form

FEMALE. Wing: 3.33 mm. Proboscis: 2.71 mm. Forefemur: 2.34 mm. Abdomen: broken off. Extremely similar to *aureolineatus* and differing apparently chiefly in the following. Mesonotal ornamentation darker; acrostichal golden line narrower; dorsocentral golden line represented only by a rounded spot at about 0.5 of mesonotum; fewer scattered golden scales; *apn* scales more numerous and broader, more distinctly silvery; *ppn* scale patch more extensive, with some broad scales below.

MALE and IMMATURE STAGES. Unknown.

DISCUSSION. The single specimen from Iquitos, Peru, Mar-Apr 1931, R.C. Shannon [USNM] lacks the abdomen. It may represent a distinct species related to *arborealis* and *aureolineatus* or a local population of one of these. This form shows the greatest reduction in the golden scaling on the anterior part of the mesonotum in the Fulvithorax Group.

WALKERI SECTION

FEMALES. Usually small to medium sized species, wing 2.1-3.5 mm. *Head*: Submedian dark patch broad; lateral patch smaller, bordered posteriorly by light scales. Erect scales varied. Torus brown to dark brown, with a few small black scales mesally. Palpus with or without apical light scales. *Thorax*: Mesonotum usually with distinct linear light pattern (except in some *grabhami*), light scales all golden or combination of golden and silvery. Acrostichal line absent but a small light patch present at level of anterior promontory; inner and outer dorsocentral lines incomplete, inner not reaching scutellum, outer usually not reaching anterior margin; lateral marginal line broken at scutal angle, usually narrow (very broad in Walkeri Group); median prescutellar line present. Paratergite bare. Acrostichal bristles usually absent on disc, present in Busckii Group. Pleural scales silvery (fig.17); *ppn* and *psp* without scales; *ssp* scale patch present or absent; *mep* with a small, restricted patch at upper half below bristles only. *Legs*: Midfemur and hindfemur without distinct distal light spot on anterior surface. Foretibia sometimes with light scales distally. Tarsal light markings not restricted to segment 1. *Wing*: Veins entirely dark scaled. *Abdomen*: Sternites II-IV without dark scales.

MALES. Larger claws of foreleg and midleg with both submedian and basal teeth present (in Busckii Group basal tooth absent).

MALE GENITALIA. Lobes of tergite IX indistinct, bearing a few strong setae. Sidepieces separated from each other at base by a distance greater than diameter of aedeagus at that level; tergomesal and sternomesal margins without any indication of lobes. Claspette represented by a small roughly triangular or fingerlike lobe bearing 1, rarely 2, apical setae; not connected to its mate.

PUPAE. *Cephalothorax*: Hair 5-C usually shorter than distance between its base and that of trumpet; either subequal to or longer than hair 4-C; if longer, varied in branching. *Abdomen*: Hair 5-IV,V usually single (double or triple in Aurites and Busckii Groups), terminating before or extending beyond apex of tergite following;

2-IV-VI usually distad of 0.75 of its tergite; 9-III-VI usually caudolaterad of hair 6 (except in *walkeri*); 9-VII moderately to strongly developed, either close to or removed considerable distance cephalad of hair 6.

LARVAE. Stellate hairs developed or not. *Antenna*: Short; with or without scattered spicules; hair 1-A single. *Thorax*: Integument glabrous. Tubercles of hairs 5-7-P distinctly joined; hair 9-P simple, usually single or double; hair 13-P absent except in Ioliota Group. *Abdomen*: Integument glabrous except in *walkeri* and members of Ioliota Group. Hairs 2,5,9-VII usually stellate; hair 8-VII cephalad or cephalodorsad of 9-VII. *Segment VIII*: Hairs 1,5-VIII usually strong, with a few branches but not stellate. Comb scales usually in a single row (up to 2-4 irregular rows in Busckii Group); individual scale usually blunt apically. *Siphon*: Index 2.0-8.5. Integument smooth, imbricate or spiculate. Acus distinct except in Walkeri and Aurites Groups. Pecten teeth with or without basal denticles. *Anal Segment*: Saddle with distinct marginal spicules. Hair 1-X short to moderate, with a few branches; hair 3-X single, 2-X multiple. Ventral brush with 5 or 6 pairs of hairs arising from a boss with or without distinct grid bars.

DISCUSSION. The Walkeri Section is the most heterogeneous of the 3 sections in the subgenus, particularly in the immature stages. However, it is probably a monophyletic lineage characterized by 3 unique features of adult ornamentation: paratergite and *ppn* both without scales and prescutellar area with a median light-scaled line.

Four rather distinct phylads within the section are suggested by differences in the mesonotal pattern of the adults: (1) Aurites Group, with a rather broad linear golden pattern very reminiscent of the Sexlineatus Section, (2) Walkeri Group, with a very broad continuous lateral silvery patch and apparently relatively broad golden dorsocentral lines, (3) the very similar Ioliota and Albonotatus Groups, with a very narrow silvery lateral line, very faint golden dorsocentral lines and a silvery prescutellar line, and (4) Busckii Group, intermediate between the Walkeri Group and the Ioliota-Albonotatus Groups in the width of the lateral silvery line which is frequently broken. The Busckii Group is unique in the subgenus in the presence of acrostichal bristles on the disc of the mesonotum.

The immature stages are much more diverse than in the other sections, each of the above-mentioned phylads possessing a type quite as distinct as those characterizing the Sexlineatus and Fulvithorax Sections. The Ioliota Group is also clearly separated in the larval and pupal stages from the Albonotatus Group. The breeding sites in the Walkeri Section encompass the entire range used by the subgenus, extending to habitats not utilized by the other sections.

The Walkeri Section is almost entirely confined to islands in the Caribbean area. Only 2 small encroachments on present continental areas are known: (1) in the Yucatan Peninsula by the Ioliota Group and (2) in northern Venezuela and Trinidad by the Ioliota Group and northern Venezuela only by the Walkeri Group. The groups show primarily allopatric complementary distributions. The only exceptions known are in (1) the Walkeri and Aurites Groups in Jamaica, (2) possibly Albonotatus and Busckii Groups in Guadeloupe, and (3) Ioliota and Walkeri Groups in northern Venezuela. Except in the Aurites Group, members of a group always have allopatric distributions (fig.3).

There are 2 surprising gaps in the distribution of the Walkeri Section. Although intensive collections have been made in Puerto Rico, Virgin Islands and Leeward Islands, no species of *Howardina* has yet been recorded from this area. Nor has the subgenus been recorded from Cuba. However, it is possible that the record of *Haemagogus* sp. from Cuba by Montchadsky and Garcia (1966:46-47) is based on a misidentification of an undescribed species of *Howardina*.

The diversity of types in the Walkeri Section is undoubtedly a reflection of typical insular speciation through isolation of small populations. As indicated above, it appears that only one original stock was probably involved, although there is a suggestion of a possible recent intrusion of the Sexlineatus Section in the Aurites Group (see). However, the present pattern could not have been attained through a simple splitting of the original stock among the island masses as they exist today. The retention of such primitive features as acrostichal bristles in the adults of *busckii*, hair 13-P in the larvae of the Ioliota Group, 6 pairs of hairs in the ventral brush in all species except *busckii* and a patch of comb scales in the larvae of some populations of *busckii*, is indicative of very early separation of the Walkeri Section from the other sections rather than its recent derivation from one of them. That the present pattern represents speciation and dispersal on island masses no longer in existence in the Caribbean area is strongly supported by the relict distributions of the Walkeri and Ioliota Groups.

KEYS TO GROUPS AND SPECIES

ADULTS

1. All mesonotal light scaling golden (Aurites Group) 2

At least lateral marginal line silvery or white 4

Aurites Group

2(1). Pleuron with a large silvery patch continuous from lower *pra* across posterior *stp* to its lower margin . . . . 8. *aurites*

Pleuron with 3 small discrete, separate silvery patches, one each on lower *pra*, upper *stp* and lower *stp* 3

3(2). Antealar area (above paratergite) with golden scales, rarely 1-3 bronzy scales present; mesonotal light lines usually distinct and broad, sometimes almost completely merging in anterior two-thirds of mesonotum . . 9. *grabhami*

Antealar area with numerous dark bronzy scales above narrow posterior lateral mesonotal golden line; mesonotal light lines narrow, discrete, never merging . . . . 10. *inaequalis*; 11. *stenei*

4(1). Lateral marginal line broadened to form a conspicuous lateral silvery patch; *ssp* without scales (Walkeri Group) 5

Lateral marginal line very narrow, not extending on fossa; *ssp* with patch of silvery scales 6

Walkeri Group

5(4). Inner dorsocentral line continuous, moderately broad . . . . . 6. *walkeri*

Inner dorsocentral line dotted, only faintly indicated . . . . . 7. *argyrites*

Busckii Group

6(4). Median prescutellar line golden, faint; palpus entirely dark in both sexes; acrostichal bristles present on disc . . . . 12. *busckii*

Median prescutellar line silvery, conspicuous; silvery scales on apex of female palpus and base of some segments of male palpus; acrostichal bristles absent on disc 7

7(6). Hindtarsal segment 5 with white scales (Ioliota Group) 8
Hindtarsal segment 5 with black scales only (Albonotatus Group) 9

Ioliota Group

8(7). Hindtarsal segment 5 entirely white-scaled . . . . *12. ioliota*
Hindtarsal segment 5 with some apical and posterior dark scales . . . . *13. cozumelensis*

Albonotatus Group

9(7). Hindtarsal segment 3 white-scaled in barely more than basal 0.5 . . . . *15. bahamensis*
Hindtarsal segment 3 white-scaled in at least basal 0.7 . . . *14. albonotatus*

MALE GENITALIA

(*7. argyrites* not definitely known)

1. Tergal surface of sidepiece with very dense vestiture of long bristles, some as long as sidepiece . . . . *15. bahamensis*
Tergal surface of sidepiece with sparse vestiture of short or moderate bristles, none more than 0.5 of sidepiece length 2

2(1). Clasper very long, including spiniform about as long as sidepiece . . . . *14. albonotatus*
Clasper short or moderate, including spiniform not more than 0.75 of sidepiece length 3

3(2). Claspette with an apical fingerlike cylindrical process more than twice as long as wide and bearing apical bristles; body of claspette with short subapical bristles 4
Claspette without distinct apical fingerlike cylindrical process, apical bristle borne on a short broad conical process; body of claspette with several strong subapical bristles borne on similar but smaller tubercles 5

4(3). Apex of aedeagus deeply emarginate in dorsal aspect producing lateral lobes and/or distal half of aedeagus distinctly broader than proximal half; basal tergal bristles of sidepiece strong, subequal in length and development to tergomesal marginal bristles . . . . *16. busckii*
Aedeagus not emarginate apically in dorsal aspect and roughly of uniform width; basal tergal bristles of sidepiece weak, much shorter and weaker than tergomesal marginal bristles . . . .*8. aurites; 9. grabhami; 10. inaequalis; 11. stenei*

5(3). Clasper more than 0.5 of sidepiece length, without distinct subapical setae . . . . *6. walkeri*
Clasper less than 0.5 of sidepiece length, with distinct subapical setae . . . 6

6(5). Clasper gradually tapered to distal 0.75 . . . . .13. *cozumelensis*
Clasper swollen on base, abruptly tapered at about middle . . . 12. *ioliota*

PUPAE

(7. *argyrites* unknown)

Walkeri Group

1. Paddle deeply emarginate at hair 1 . . . . 6. *walkeri*
Paddle usually smoothly rounded on apex, at most shallowly emarginate at hair 1 2

2(1). Hair 10-C usually at least 10-branched (Aurites Group) 3
Hair 10-C usually less than 5-branched. 6

Aurites Group

3(2). Pigmentation very light and uniform; metanotum uniformly lightly pigmented 4
Pigmentation moderate and uneven; metanotum with light area in the middle of lateral surface 5

4(3). Hair 2-VI distinctly laterad of hair 3. . . . . .8. *aurites*
Hair 2-VI mesad or at level of hair 3. . . . . .9. *grabhami*

5(3). Median tergal darkening of abdominal segment III indistinct. . . . . 10. *inaequalis*
Median tergal darkening of abdominal segment III sharply marked . . . . .11. *stenei*

6(2). Hair 5-C at least 2.0 of hair 4 (Ioliota Group) 7
Hair 5-C subequal to hair 4 (Albonotatus and Busckii Groups). 8

Ioliota Group

7(6). Hair 1-II strongly dendritic and with many branches; paddle ovoid, length about 1.5 greatest width . . . . 12. *ioliota*
Hair 1-II with 7-12 simple branches; paddle rounded, length about 1.2 greatest width .13. *cozumelensis*

Albonotatus and Busckii Groups

8(6). Hairs 7,10-C both single; paddle elongate, length more than 1.5 greatest width . . . . 14. *albonotatus*
Hairs 7,10-C usually at least double; paddle length moderate, usually less than 1.3 greatest width. 9

9(8). Pinna very long, more than 0.33 of total trumpet length; paddle slightly emarginate at hair 1; hair 6-III,IV strong, usually at least double . . . . 15. *bahamensis*
Pinna moderate, about 0.25 of total trumpet length; paddle evenly rounded on apex; hair 6-III,IV weak, single . . . . 16. *busckii*

LARVAE

(*7. argyrites* unknown)

Walkeri Group

1. Abdominal integument densely covered with large dark-branched spicules . . . . *6. walkeri*
Abdominal integument glabrous at 100X. 2

2(1). Hair 13-P present (Ioliota Group). 3
Hair 13-P absent 4

Ioliota Group

3(2). Siphon slightly swollen in middle, index about 2.5; comb scales blunt or rounded apically . . . . *12. ioliota*
Siphon slightly evenly tapered from base, index about 2.0; comb scales pointed apically . . . . *13. cozumelensis*

Busckii Group

4(2). Ventral brush with 5 pairs of hairs (comb scales sometimes in 2 to 4 rows; pecten teeth sometimes extending well beyond hair 1-S) . . . *16. busckii*
Ventral brush with 6 pairs of hairs 5

5(4). Head hair 6-C usually single or double; pecten teeth short and with basal denticles; siphon index 3.0 or less (Albonotatus Group) 6
Head hair 6-C multiple, usually more than 5-branched; pecten teeth long, slender and without basal denticles; siphon index more than 4.0 (Aurites Group) 7

Albonotatus Group

6(5). Anal gills subequal; siphonal hair 1-S adjacent to last pecten tooth . . . . *14. albonotatus*
Anal gills markedly unequal; siphonal hair 1-S well beyond last pecten tooth . . . . *15. bahamensis*

Aurites Group

7(5). Hair 2-VII large, stellate, 4-7-branched. . . . . *11. stenei*
Hair 2-VII small, single. 8

8(7). Siphon index less than 5.5; anal gills markedly unequal, the small distinctly shorter than saddle . . . . *10. inaequalis*
Siphon index 6.0 or more; anal gills subequal and distinctly longer than saddle 9

9(8). Head hair 5-C usually single; 7-C very short, less than 0.25 of antenna, and usually triple . . . . *9. grabhami*
Head hair 5-C usually at least triple; 7-C about 0.5 of antenna and usually 6-branched . . . . *8. aurites*

Walkeri Group

FEMALES. *Head*: Narrow decumbent scales white. Palpus with apical silvery scales (broken in *argyrites*). *Thorax*: Inner dorsocentral line golden, continuous or dotted; median prescutellar line broad, white or predominantly white; outer dorsocentral line faint, narrow, golden; lateral marginal line broadened to form a conspicuous lateral silvery patch from anterior angle to wing base. Acrostichal bristles not developed on disc. Scutellum predominantly dark scaled, light scales restricted to median lobe. *Ssp* without scales; upper *stp* patch separate, large. *Legs*: Foretarsus completely dark; midtarsus with incomplete or complete basal white ring on segment 1; hindtarsus with moderate basal white rings on segments 1-3 in *walkeri*, at least on 1-2 in *argyrites* (rest broken). *Abdomen*: Basomedian tergal light markings creamy, present on proximal segments.

MALE (*walkeri* only). Palpus with basomedian white scales on segments 4,5. Larger claw of foreleg and midleg with both submedian and basal teeth; smaller claw with basal tooth only.

MALE GENITALIA (*walkeri* only). Claspette with short broad conical tubercle bearing 1 apical bristle. Clasper about 0.6 of sidepiece; minute spicules basally; subapical hairs absent. Aedeagus subquadrate, shorter than proctiger, without apical lobes.

PUPA (*walkeri* only). *Cephalothorax*: Hair 5-C usually at least triple, moderately long, subequal to distance from its alveolus to trumpet base and at least 2.0 as long as hair 4; hair 7-C usually 3-branched; hair 10-C with 2-7 branches. *Abdomen*: All large hairs except 1-II,III, 9-VII,VIII usually single or double; hair 2-II laterad of or in line with hair 3; hair 5-IV,V usually extending to apex of tergite following; hair 9-II-VI usually at level or slightly cephalad of hair 6; 9-VII subequal to hair 6-VII; hair 4-VIII single. *Paddle*: Short; apex distinctly emarginate; marginal spicules distinct.

LARVA (*walkeri* only). *Head*: Hair 1-C always branched, usually triple; 4-C unusually long, multiple; 5-C single, long and stout; 6-C usually 4-branched; hairs 11, 12,14-C all stellate, 11-C with unequal branches; 15-C double, long, exceeding apex of mental plate. *Antenna*: Shaft with scattered, short, sharp spicules; hair 1-A single. *Thorax*: Hair 13-P absent. Hairs 0,1,3,4,8,14-P, 1,13,14-M, 1,3,4,5,8,13-T all strongly stellate, with numerous branches, very darkly pigmented; hairs 1-M,T far mesad of hairs 2,3. *Abdomen*: Integument with numerous very dark, large branched spicules; hairs 2 and 9 removed cephalad of hair 8. Hairs 1,2,5,9,13-I-VI, 11-I, 7-II-VI all strongly stellate as on thorax; hair 8-VII cephalodorsad of 9-VII. *Segment VIII*: Comb scales in a single row; individual scale long, pointed and fringed to apex. *Siphon*: Index less than 3.0; integument with rows of short spicules; acus absent, no indication of basal indentation. Pecten extending almost to apex; teeth long, proximal ones simple, distal branched apically. *Anal Segment*: Saddle body with numerous strong spicules; caudal margin with long fringed spines; hair 1-X multiple, near lower end of caudal margin. Ventral brush with 6 pairs of hairs on very strongly sclerotized boss without distinct grid bars.

DISCUSSION. The diagnosis of the group is based almost entirely on *walkeri*, the type species of the subgenus and a common species endemic to Jamaica. *A. argyrites*, known only by the imperfect female holotype from northern Venezuela and possibly a male genitalia slide, is extremely similar to *walkeri* in adult ornamentation and is undoubtedly a member of this group.

The Walkeri Group possesses many features unique in the section, particularly in the immature stages which are readily recognized from all other species in the subgenus. However, the mesonotal pattern of the adults suggests a greater affinity with the Aurites Group than with any other group. As indicated under the latter, this is interpreted here as an indication of introgression with the Sexlineatus Section.

The widely disjunct distribution of the 2 members of the Walkeri Group parallels that of the 2 members of the Ioliota Group and is similarly interpreted as a relict pattern of a group originally with a wide distribution in the central Caribbean area (fig. 3).

The group may be primarily a breeder in bromeliads as is the case with *walkeri* but since the latter sometimes uses treeholes it is possible that these may have been the original breeding sites, perhaps still retained by *argyrites*.

6. Aedes (Howardina) walkeri (Theobald)

Figs.3,7,8,16-18

1901.*Culex walkeri* Theobald, 1901:424. TYPE: Holotype ♀ (45/110), Jamaica, date and collector not specified [BM].

Aedes (Howardina) walkeri of Bonne and Bonne-Wepster (1925:368); Dyar (1928:235); Edwards (1932:156); Lane (1939:101; 1953:725-726); Horsfall (1955:471); Stone, Knight and Starcke (1959:174); Belkin, Schick and Heinemann (1965:31); Forattini (1965:399,400); Porter (1967:38).

Aedes walkeri of Dyar and Knab (1906b:189,192); Howard, Dyar and Knab (1912:70; 1917:849-852); Picado (1913:325); Dyar (1918:73,80); Johnson (1919:424); Gowdey (1926:74); Thompson (1947:78); Hill and Hill (1948:46).

Howardina walkeri of Theobald (1903a:287-289); Dyar (1905a:49; 1905b:23; 1905c:27-28); Theobald and Grabham (1905:20-22); Theobald (1905:9; 1907:215-216; 1910:220); Coquillett (1906b:26); Grabham (1906:170-171); Surcouf and Gonzalez-Rincones (1911:139-140).

Culex walkeri of Blanchard (1905:416).

Haemagogus walkeri of Dyar and Knab (1906a:166).

FEMALE (fig.16). Wing: 2.62 mm. Proboscis: 2.1 mm. Forefemur: 1.75 mm. Abdomen: about 2.45 mm. As described for group, with the following apparently diagnostic features. *Head*: Median stripe on vertex broad, silvery; light scales on sides and venter creamy. *Thorax* (figs.8,16): Scales on anterior promontory golden. Inner dorsocentral line distinct, continuous and moderately broad; median prescutellar line usually silvery, sometimes with a few golden scales, rarely predominantly golden; outer dorsocentral line golden; lateral marginal line very broad, silvery. Antealar area above paratergite with silvery scales. Silvery scales on median scutellar lobe narrow; lateral lobes with narrow dark scales. Pleural scales as in the group. *Legs*: Forefemur and midfemur predominantly dark anteriorly, a few basal scales creamy, proximal 0.5 of posterior surface broadly creamy, extending distally as a light line, rest dark; hindfemur mostly creamy except for lateral distal dark scales. Midtarsal segment 1 with only a few white scales at base. *Haltere*: Stem pale, knob mostly dark, fringe scales creamy white. *Abdomen*: Basomedian tergal creamy patches distinct on III-VII, a few pale scales on II. Sternites creamy on II-IV, rest of segments with basal creamy and apical dark scales.

MALE (fig.16). Wing: 2.28 mm. Proboscis: 1.93 mm. Forefemur: 1.04 mm. Essentially similar to female in color.

MALE GENITALIA (fig.17). As figured; diagnostic characters as in the key. Ninth tergite lobe indistinct, with 3,4 strong setae. Sidepiece about 2.5 times median width.

Clasper with minute spicules basally; spiniform about 0.2 of clasper.

PUPA (fig.17). Abdomen: 2.7 mm. Trumpet: 0.38 mm; index about 4.5-5.0. Paddle: 0.46 mm. Chaetotaxy as figured; hairs moderately to darkly pigmented. Diagnostic characters as in the key. Readily separated from all other species of the subgenus by the presence of minute denticles on abdomen and by the distinctly emarginate paddle. *Cephalothorax*: Mesonotum moderately pigmented between trumpets, slightly deeper laterally; trumpets contrasting. Hair 1(1), 2(2, 2-3), 3(1, 1-2), 4(3, 2-5), 5(5, 3-6), 6(1, 1-2), 7(3, 2-4), 8(3, 1-5), 9(1), 10(5, 2-7), 11(1, 1-2), 12(3, 2-5). *Abdomen*: Tergite I moderately to strongly pigmented except for usual membranous areas; remaining segments moderately to strongly pigmented, progressively lighter caudad; integument with minute denticles. Segment I: hair 1(8-12 primary branches, each with many secondary branches), 2(1, 1-2), 3(1), 4(3, 2-5), 5(4, 3-6), 6(1, 1-2), 7(2, 1-3), 9(1, 1-2). Segment II: hair 0(1), 1(8, 5-17), 2(1), 3(1), 4(2, 2-4), 5(2, 1-3), 6(1, 1-2), 7(3, 1-4), 8(1, present in some), 9(1). Segment III: hair 0(1), 1(4, 2-9), 2(1, 1-2), 3(1), 4(2, 1-3), 5(2, 1-3), 6(1), 7(2, 2-5), 8(3, 2-5), 9(1), 10(1, 1-2), 11(1), 14(1). Segment IV: hair 0(1), 1(3, 2-4), 2(1, 1-3), 3(3, 2-6), 4(2, 1-2), 5(2, 2-3), 6(1, 1-2), 7(2, 1-4), 8(2, 2-3), 9(1), 10(1, 1-3), 11(1), 14(1). Segment V: hair 0(1), 1(2, 1-3), 2(1, 1-3), 3(1, 1-3), 4(1, 1-5), 5(2, 2-4), 6(1, 1-2), 7(2, 2-5), 8(2, 2-4), 9(1), 10(1, 1-2), 11(1), 14(1). Segment VI: hair 0(1), 1(1, 1-3), 2(1, 1-3), 3(1, 1-2), 4(2, 1-4), 5(3, 2-4), 6(1, 1-2), 7(2, 1-3), 8(2, 2-3), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1, 1-3), 2(1, 1-3), 3(2, 1-3), 4(1, 1-2), 5(2, 1-4), 6(5, 3-6), 7(1, 1-2), 8(2, 2-6), 9(6, 6-9), 10(1), 11(1, 1-4), 14(1). Segment VIII: hair 0(1), 4(1), 9(12, 11-16), 14(1, 1-2), *Paddle*: Uniformly lightly pigmented, midrib slightly darker; dorsal surface with fine denticles, external margin serrated; apex deeply emarginate; hair 1-P slender. Male genital lobe extending to 0.5 of paddle, female genital lobe to 0.41.

LARVA (fig.18). Head: 0.7 mm. Siphon: 0.43 mm. Anal Saddle: 0.22 mm. Chaetotaxy as figured; hairs darkly pigmented. Diagnostic characters as in the key. Readily differentiated from all other species of the subgenus by: (1) stellate hairs with numerous branches, (2) dendritic spicules on abdomen and (3) pecten teeth extending almost to apex of siphon. *Head*: Width subequal to length; integument smooth and strongly pigmented. Mental plate with 12 distinct teeth on each side of strong median tooth, often a smaller detached tooth at base. Hair 0(1), 1(3, 2-3), 3(1), 4(6, 5-8), 5(1), 6(4, 2-5), 7(4, 3-5), 8(1), 9(2), 10(1), 11(14, 9-17; stellate, branches of 3 lengths), 12(10, 8-17), 13(1), 14(15, 11-24; stellate), 15(2, 1-3). *Antenna*: Length about 0.3 of head; uniformly strongly pigmented; with scattered spicules; all hairs usually single; hair 1-A about 0.62 from base. *Thorax*: Integument glabrous; in life thorax appears bluish green. Apex of long hairs attenuate; stellate hairs with numerous branches; long and stellate hairs weakly barbed. Prothorax: hair 0(32, 30-46), 1(32, 27-38), 2(1), 3(26, 24-36), 4(36, 30-42), 5(4, 3-5), 6(1, 1-2), 7(3, 2-4), 8(36, 30-38), 9(2, 1-4), 10(1), 11(4, 3-5), 12(1), 14(48, 44-54). Mesothorax: hair 1(36, 25-54), 2(1), 3(1), 4(1), 5(1), 6(8, 5-8), 7(1), 8(8, 7-10), 9(10, 7-14), 10(1), 11(3, 2-4), 12(1), 13(22, 17-27), 14(23, 19-29). Metathorax: hair 1(54, 48-63), 2(1), 3(22, 19-24), 4(28, 28-34), 5(25, 22-33), 6(1), 7(8, 7-10), 8(19, 16-23), 9(8, 6-8), 10(1, 1-2), 11(3, 2-4), 12(1), 13(42, 38-43). *Abdomen*: Integument densely packed with large dendritically branched spicules, more sparsely on segment I; stellate hairs as on thorax. Segment I: hair 1(53, 51-71), 2(40, 40-53), 3(1), 4(2, 1-2), 5(29, 28-41), 6(3, 3-4), 7(1, 1-2), 9(14, 9-15), 10(1), 11(26, 24-30), 13(35, 29-38). Segment II: hair 0(1), 1(60, 52-65), 2(46, 36-46), 3(1), 4(2, 1-3), 5(32, 25-36), 6(4, 3-4), 7(18, 14-22), 8(1), 9(20, 18-22), 10(1), 11(1), 12(1), 13(36, 33-44). Segment III: hair 0(1), 1(64, 56-66), 2(41, 35-45), 3(1), 4(1), 5(34, 30-40), 6(3, 2-3), 7(20, 20-24), 8(1), 9(21,21-26), 10(1), 11(1), 12(1), 13(36,32-44), 14(1). Segment IV: hair 0(1), 1(60, 54-62), 2(42, 36-46), 3(1), 4(1, 1-2), 5(37, 30-42), 6(2, 2-3), 7(20, 18-22), 8(1), 9(24, 22-27), 10(1), 11(1), 12(1), 13(40, 25-41), 14(1). Segment V: hair 0(1), 1(60, 47-61), 2(37, 37-42), 3(1), 4(3, 1-3), 5(36, 30-41), 6(2, 2-3), 7(20, 18-25), 8(1), 9(26, 25-31), 10(1), 11(1), 12(1), 13(36, 30-42), 14(1, 1-2). Segment VI: hair 0(1), 1(56, 44-60), 2(41, 36-41), 3(1), 4(2, 1-2), 5(30, 30-42), 6(2, 1-2), 7(22, 18-24), 8(1), 9(28, 25-29), 10(1), 11(1), 12(1), 13(34, 28-38), 14(1). Segment VII: hair 0(1), 1(50, 42-50), 2(36, 30-40), 3(1), 4(1), 5(28, 28-39), 6(20, 16-26), 7(1), 8(24, 22-28), 9(26, 26-32), 10(1), 11(1), 12(1), 13(22, 20-28), 14(2). *Segment VIII*: Comb scales in a single row of 12(10-14); individual scales long, pointed apically, fringed to the tip. Hair 0(1), 1(48, 46-54), 2(1), 3(8, 8-10), 4(1), 5(28, 26-31), 14(2, 1-2). *Siphon*: Index about 2.8-2.9; darkly pigmented; integument uniformly pilose. Pecten extending beyond hair 1-S, almost to apex; 20(16, 22) teeth, progressively longer distad, individual teeth long, without basal denticles, distal teeth broad, with apical denticles. Hair 1-S about 0.67 from base. Hair 1(3, 2-4), 2(1), 3-5 not visible, 6(1), 7(1), 8(1), 9(1). *Anal Segment*: Saddle strongly pigmented, with darker basal ring; integumentary spicules progressively larger distally; caudal margin with long spines fringed laterally. Gills narrow, moderately long, ventral pair slightly shorter than dorsal. Hair 1(8, 6-10; strong, at caudolateral angle), 2(12, 10-14), 3(1), 4a(7, 6-8), 4b(7, 6-7), 4c(6, 5-8), 4d(6, 6-7), 4e(6, 6-7), 4f(5, 4-7).

EGG. Length about 0.62 mm, width about 0.14 mm; exochorion transparent and endochorion dark and with polygonal sculpturing.

SYSTEMATICS. *A. walkeri*, the type species of *Howardina*, is among the most clearly marked species in the subgenus. In the adults, only the closely related *argyrites*, known by a single female from Venezuela, could be confused with *walkeri*. The immature stages are also very strikingly differentiated but it would not be surprising if those of *argyrites*, when found, were to conform to the same general type in view of the resemblance of the females.

Little variation is apparent in the extensive material of *walkeri*, either in the adults or the immature stages. Only the median prescutellar line exhibits some noticeable variation, ranging from entirely silvery in the majority of specimens to predominantly golden in a few. The dorsocentral lines are always clearly marked and never dotted as in *argyrites*.

BIONOMICS. The breeding sites of *walkeri* are usually bromeliad axils but a few collections of immatures have been made in treeholes (JA 336,390), broken and cut bamboo (JA 711,778), heliconia axils (JA 748) and a crabhole (JA 369). Both terrestrial and arboreal bromeliads are used by *walkeri*. This species has been found associated with all members of the Aurites Group and appears to have a much wider altitudinal and geographical range than any other species of *Howardina* on Jamaica. The larvae of *walkeri* are readily recognized in the field by their very dark and "hairy" bodies.

Females of *walkeri* commonly bite humans under the shade of bromeliad laden trees. I found a maximum peak of activity in mid morning (0900) and a lesser one in late afternoon (1700) as shown in fig.7. However, Hill and Hill (1948:46) state that *walkeri* prefers to feed at dusk in the open, and bites at any time of the day in forest shade.

DISTRIBUTION (fig.3). Endemic to the island of Jamaica where it is widespread at elevations from 100 ft to 4500 ft. Material examined: 2964 specimens; 244 ♂, 1139 ♀, 699 pupae, 882 larvae; 516 individual rearings (237 pupal, 150 larval, 129 incomplete).

JAMAICA. *Clarendon*: Honeycomb Rock, elev. 800 ft, 8 Aug 1965, W.A. Page (JA 237), 1 lp (237-27) [UCLA]. Mocho Road, 10 Sept 1965, J.N. Belkin, 1 ♀ (JA 353) [UCLA]. Slippery Fall, elev. 800 ft, 8 Aug 1965, W.A. Page, 1 L (JA 239) [UCLA]. *Hanover*: Copse, elev. 500 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson (JA 668), 1 p♂ (668-101), 1 p♀ (668-100), 6 L, 2 l [UCLA]. Lethe, elev. 500 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson, 4 p, 1 L, 5 l (JA 655), 1 lp♀ (667-10), 5 p♂ (667-100-104), 5 lP (667-11-15), 2 ♀, 2 P, 4 p, 34 L, 4 l (JA 667) [UCLA]. *Manchester*: Hope Farm, elev. 1000-1100 ft, 10 Sept 1965, W.A. Page, 1 p♀ (354-102), 1 lP (354-13), 55 ♀ (JA 356); 23 Oct 1966, O.G.W. Berlin and D.C. Watson, 31 ♀ (JA 634A), 2 lp♂ (635-11,16), 2 lp♀ (635-10,12), 4 p♂ (635-100-103), 1 p♀ (635-104), 8 lP (635-13-15,17-21), 1 P, 2 l (JA 635); 2 Nov 1966, O.G.W. Berlin, 12 ♀ (JA 663A), 779 ♀ (JA 684) [UCLA]. Mandeville, elev. 900 ft, 23 Oct 1966, O.G.W. Berlin and D.C. Watson (JA 639), 4 lp♀ (639-10,14,22,25), 8 p♂ (639-101,104,107-111,114), 7 p♀ (639-100-103,105,106,112,113), 12 lP (639-11-13,15-21,23,24), 9 ♂, 4 ♀, 18 P, 22 p, 62 L, 24 l; 24 Oct 1966, O.G.W. Berlin (JA 640), 1 lP (640-10), 1 L [UCLA]. Melrose Hills, elev. 900 ft, 8 Aug 1965, W.A. Page (JA 244), 1 lp♂ (244-43), 1 p♀ (244-41A), 1 lP (244-40), 7 P [UCLA]. Porus, elev. 900-1000 ft, 8 Aug 1965, W.A. Page (JA 243), 2 lp♂ (243-22,29), 3 lp♀ (243-21,26,27), 1 p♂ (243-102), 2 p♀ (243-101,103), 2 lP (243-19,20), 1 P, 15 L; 23 Oct 1966, O.G.W. Berlin and D.C. Watson, 1 lP (631-30), 2 lp♀ (633-11,12), 1 p♀ (633-100), 5 lP (633-10,13-16), 4 L (JA 633); 1 Nov 1966, O.G.W. Berlin (JA 657), 2 lp♂ (657-10,11), 1 p♂ (657-100), 2 p♀ (657-101,102), 2 lP (657-13,14), 2 P, 2 p, 1 L, 7 l; 2 Nov 1966, O.G.W. Berlin, 1 lp♂ (660-10), 1 p♂ (660-100), 1 P (JA 660), 1 lp♀ (664-12), 4 p♂ (664-100,103-105), 2 p♀ (664-101,102), 2 lP (664-10,11), 1 P, 22 L (JA 664) [UCLA]. Williamsfield, elev. 1100 ft, 23 Oct 1966, O.G.W. Berlin and D.C. Watson (JA 637), 4 lp♂ (637-10,11,13,17), 3 lp♀ (637-12,23,27), 10 p♂ (637-100-105, 108-110,112), 3 p♀ (637-106,107,111), 11 lP (637-14-16,18-22,24-26), 3 p, 25 L, 1 l [UCLA]. *Portland*: Ecclesdown, elev. 1000 ft, 22 Aug 1967, J.N. Belkin and W.A. Page (JA 748), 1 p♀ (748-94), 1 p [UCLA]. Fairy Hill, elev. 100 ft, 13 Nov 1966, O.G.W. Berlin and D.C. Watson, 20 L, 2 l (JA 693), 4 lp♂ (694-11,13,14,17), 9 lp♀ (694-10,12,15,18-23), 21 p♂ (694-100-103,106-108,112-117,119-121,123,125,128-131), 13 p♀ (694-101,104,105,109-111,118,122,124,126,132,133), 1 lP (694-16), 4 ♂, 1 ♀, 2 P, 2 p, 34 L (JA 694), 19 L (JA 695) [UCLA]. Kemney-Sherwood Forest, elev. 750 ft, 13 Aug 1967, J.N. Belkin and W.A. Page (JA 707), 3 lp♂ (707-10-12), 2 p♂ (707-100, 102), 1 lP (707-13), 1 P, 1 L; 13 Aug 1967, W.A. Page, 2 lp♂ (708-11,12), 1 lp♀ (708-15), 1 ♂ (JA 708), 1 lp♂ (709-10), 1 p♂ (709-101), 1 p, 1 L (JA 709), 1 L (JA 710), 1 lp♂ (716-10), 3 p♂ (716-100,101,104), 1 P, 4 L (JA 716) [UCLA]. Portland Point, 4 Aug 1942, C.B. Philip, 1 ♀ [USNM]. *St. Andrew and Kingston*: Castleton, elev. 600 ft, 27 Oct 1966, O.G.W. Berlin and D.C. Watson (JA 645), 2 lP (645-10,11), 1 P, 5 L, 5 l [UCLA]. Duhaney River, 6 Nov 1965, W.A. Page (JA 399), 1 lP (399-13) [UCLA]. Ferry Quarry, 13 Sept 1965, W.A. Page, 1 ♂ (JA 369) [UCLA]. Hardwar Gap, elev. 3800 ft, 29 Oct 1966, O.G.W. Berlin (JA 647), 2 lp♂ (647-10,11), 1 lp♀ (647-12), 1 p♂ (647-100), 1 p♀ (647-101), 1 P, 1 p, 1 L, 1 l [UCLA]. Hermitage Dam, 1934, 6 ♀ [USNM]. Hermitage Dam Road, 22 Aug 1965, W.A. Page (JA 282), 1 lp♂ (282-36), 1 lp♀ (282-33), 1 lP (282-31); 13 Aug 1965, W.A. Page, 1 lP (294-44), 1 lP (304-21); 1 Sept 1965, W.A. Page, 1 lp♂ (319-22), 1 lp♀ (319-23), 1 p♂ (319-104), 31 L (JA 319), 1 lp♀ (322-23), 3 lP (322-24,31,32), 1 ♀ (JA 322), 3 L (JA 323), 2 p♀ (324-102,103), 6 L (JA 324); 7 Sept 1965, J.N. Belkin (JA 333), 1 lp♀ (333-21), 1 p♂ (333-100), 2 p♀ (333-101,102), 1 lP (333-20), 2 L; 29 Oct 1965, W.A. Page, 1 ♀ (JA 390), 1 P (JA 391), 1 lp♂ (392-12), 1 lp♀ (392-11), 6 p♂ (392-102,104,106,109,111,113), 4 p♀ (392-100,101,105,114), 1 lP (392-10), 2 ♂, 2 ♀, 2 p, 16 L (JA 392), 1 lp♂ (393-12); 15 Aug 1967, J.N. Belkin and W.A. Page, 1 lp♀ (723-30), 1 p♂ (723-103), 1 p♀ (723-102), 2 L (JA 723), 2 lp♂ (724-12,14), 3 lp♀ (724-10,11,15), 3 p♂ (724-102-104), 1 lP (724-13), 1 P, 2 p, 3 L (JA 724), 2 lp♂ (725-15,16), 1 lp♀ (725-14), 5 p♂ (725-90,100A,105A,106,108A), 3 p♀ (725-92,107,112), 3 ♂, 3 ♀, 1 P, 3 p (JA 725); 1 Sept 1967, W.A. Page and J.N. Belkin (JA 765), 1 lP (765-10), 2 L; 13 July 1967, W.A. Page (JA 843), 3 lp♂ (843-12,13,15), 3 lp♀ (843-10,11,14), 1 p♂ (843-101), 2 p♀ (843-100,102); 25 July 1967, W.A. Page, 1 L (JA 854), 1 lp♂ (855-11), 2 lp♀ (855-10,12), 3 lP (855-13-15), 1 P, 6 L (JA 855) [UCLA]. Kingston, 1 Apr 1906, M. Grabham, 1 ♂, 2 ♀ [USNM]. Mavis Bank, M. Grabham, 1 ♂ [USNM]. Mt. Salus Road, elev. 1500 ft, 11 Sept 1967, W.A. Page, 1 p♂ (777-100), 2 lP (777-10,11), 1 lp♂ (779-10), 1 p♂ (779-104), 2 p♀ (779-101,105), 1 ♀, 1 P, 2 L (JA 779); 24 July 1967, W.A. Page (JA 848), 1 lP (848-10), 1 P, 1 L, 1 l [UCLA]. Newcastle, elev. 2500-4000 ft, 5 Sept 1964, W.A. Page (JA 124), 1 lp♂ (124-15), 3 lp♀ (124-10,12,14), 1 lP (124-11), 2 L; 29 Oct 1966, O.G.W. Berlin (JA 648), 1 lp♂ (648-16), 1 lp♀ (648-19), 2 p♂ (648-100,101), 9 lP (648-10-15,17,18,20), 1 P, 9 L, 13 l; track to Catherines Peak, elev. 4000-4300 ft, 8 Nov 1966, O.G.W. Berlin, 1 P, 1 p, 1 L, 1 l (JA 678), 9 ♀ (JA 679), 2 p♀ (680-100,101), 1 ♀, 2 P, 1 p, 2 L (JA 680), 1 p, 2 L, 5 l (JA 681), 1 P, 16 L (JA 682), 1 P, 1 L, 1 l (JA 683) [UCLA]. Stony Hill, elev. 1100 ft, 18 July 1964, L. Paton (JA 85), 3 p♂ (85-101,103,104), 8 p♀ (85-100,102,105-108,110,111), 1 P, 3 L; 1 Sept 1965, W.A. Page (JA 318), 2 lp♂ (318-32,35), 1 lp♀ (318-38), 5 p♂ (318-33,34,110,111,113), 6 p♀ (318-102,104,106-109), 1 lP (318-36), 1 ♂, 8 P, 1 p, 5 L [UCLA]; 1934, 3 ♀ [USNM]. Uester Road, elev. 4500 ft, 8 Sept 1965, J.N. Belkin, 1 ♀ (JA 336), 5 lp♂ (337-10,14,15,18,24), 2 lp♀ (337-11,16), 2 p♂ (337-22,23), 1 p♀ (337-27), 1 lP (337-17), 5 ♂, 3 ♀, 1 P, 4 L (JA 337) [UCLA]. Waterworks track, elev. 1100 ft, 8 Sept 1965, J.N. Belkin (JA 335), 2 lp♂ (335-10,20), 3 lp♀ (335-11,22,30), 1 p♂ (335-100), 1 lP (335-25), 8 ♂, 2 ♀, 2 p, 6 L [UCLA]. Woodcutters Gap, elev. 4500 ft, 3 Sept 1964, W.A. Page (JA 122), 1 lp♀ (122-11), 2 ♂ (JA 122), 1 lp♂ (123-10), 1 lp♀ (123-11), 1 p♂ (123-100) [UCLA]. *St. Ann*: Moneague, elev. 500-1750 ft, 9 Sept 1965, D.C. Watson, 2 p♀ (606-100,101), 4 lP (606-10-13), 4 L (JA 606), 1 ♀ (JA 607); 17 Aug 1967, J.N. Belkin and W.A. Page, 2 L (JA 733); 31 Aug 1967, W.A. Page, 2 L (JA 762); 2.0 mi S of Moneague near Unity, elev. 1750 ft, 28 Aug 1967, W.A. Page (JA 758), 1 lp♂ (758-22), 1 lp♀ (758-21), 1 p♂ (758-102), 1 lP (758-20); 29.0 mi post on Moneague Road, elev. 1750 ft, 30 Aug 1967, W.A. Page, 5 lp♂ (763-10,11,13,15,17), 1 lp♀ (763-16), 1 p♂ (763-91), 4 p♀ (763-93,104,110,113), 3 ♂, 1 ♀, 3 p, 4 L, 1 l (JA 763), 2 lp♀ (764-11,20), 2 L (JA 764); Moneague-Claremont Road, elev. 750-1250 ft, 17 Sept 1965, W.A. Page, 1 ♂ (374-100), 1 lp♂ (379-12), 2 lp♀ (379-10,14), 1 lP (379-11), 4 L (JA 379), 1 l (JA 381); 5 Aug 1967, W.A. Page, 1 p (JA 767) [UCLA]. *St. James*: Montego Bay, elev. 500 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson (JA 669), 1 p♀ (669-103), 1 lP (669-20), 2 L [UCLA]; Jan 1940, W.H.W. Komp, 2 l [USNM]. Reading, elev. 200 ft, 6 Nov 1966, O.G.W. Berlin, 1 l (JA 670), 1 l (JA 671), 2 ♀ (JA 672) [UCLA]. *St. Mary*: Broadgate, elev. 500 ft, 25 Aug 1965, D.C. Watson, 1 L (JA 257); 27 Oct 1966, O.G.W. Berlin and D.C. Watson (JA 643), 2 lp♂ (643-10,14), 4 lp♀ (643-11-13,15), 1 p♂ (643-109), 2 p♀ (643-110,111), 1 lP (643-16), 2 p, 1 L, 8 l [UCLA]. Castleton, elev. 600 ft, 27 Oct 1966, O.G.W. Berlin and D.C. Watson (JA 644), 1 lp♀ (644-20), 1 p♀ (644-110), 6 P, 4 L [UCLA]. *St. Thomas*: Barrett's Gap, 14 Nov 1946, G.A. Thompson, 1 ♀ [IJ]. Norris, elev. 500 ft, 30 Oct 1966, O.G.W. Berlin and D.C. Watson (JA 653), 1 lp♀ (653-21), 1 p♀ (653-100), 2 lP (653-20,22), 1 P, 4 p, 1 L, 1 l [UCLA]. Pleasant Hill, elev. 250 ft, 14 June 1931, Kisliuk, 7 ♀ [USNM]. Port Morant Bay, 16 Aug 1967, J.N. Belkin and W.A. Page, 2 ♂, 1 L (JA 729) [UCLA]. Scotland Gate, elev. 500 ft, 30 Oct 1966, O.G.W. Berlin and D.C. Watson (JA 654), 5 p♂ (654-100,102,103,107,109), 5 p♀ (101,104-106,108), 10 lP (654-10-19), 1 ♀, 10 P, 10 l [UCLA]. Windsor Forest, elev. 750 ft, 30 Oct 1966, O.G.W. Berlin and D.C. Watson, 1 lp♂ (650-10), 1 p♂ (650-113), 1 p♀ (650-103), 4 lP (650-12-15), 1 P, 1 L, 2 l (JA 650), 4 lp♂ (651-10,11,14,15), 5 lp♀ (651-12,17,19-21), 7 p♂ (651-100-102,105-108), 5 p♀ (651-103,104,109, 115,116), 3 lP (651-13,16,18), 4 P, 1 p, 6 L, 1 l (JA 651) [UCLA]. *Westmoreland*: Whitehouse, elev. 100 ft, 11 Sept 1965, W.A. Page, 1 ♀ (JA 359), 3 ♀ (JA 360) [UCLA]. *Parish not specified*: Sandy Folly, Feb 1945, G.A. Thompson, 1 L; Jan 1940, W.H.W. Komp, 1 ♂; 1940, W.H.W. Komp, 1 ♀; Jan 1946, G.A. Thompson, 1 ♂, 9 ♀; 1940, 1 ♀; M. Grabham, 1 ♂, 3 ♀, 1 p, 5 l; R.B. Hill, 3 ♀; G.A. Thompson, 1 ♀ [USNM]; W.A. Page, 1 lP (771-11), 1 lp♂ (772-20), 1 lp♀ (772-21), 3 L, 1 l (JA 772), 2 lp♂ (787-12,14), 2 lp♀ (787-11,13), 3 p♂ (787-108,109,111), 7 p♀ (787-100-102,104, 105,107,112), 1 lP (787-10), 1 P, 1 p, 10 L (JA 787) [UCLA].

7. Aedes (Howardina) argyrites Dyar and Nunez Tovar

Figs.3,8

1927.*Aedes (Howardina) argyrites* Dyar and Nunez Tovar, 1927:190. TYPE: Holotype ♀, Venezuela, M. Nunez Tovar [USNM].

Aedes (Howardina) argyrites of Dyar (1928:230); Edwards (1932:155); Lane (1939:99); Anduze (1941:14); Lane (1953:708); Horsfall (1955:471); Stone and Knight (1956:226); Stone, Knight and Starcke (1959:173); Belkin, Schick and Heinemann (1965:74); Cova Garcia, Sutil and Rausseo (1966a:58; 1966b:141,333).

FEMALE. Apparently distinct from *walkeri* in the following features (fig.8). Sides and venter of head mottled with black and white scales; inner dorsocentral mesonotal line faint, narrow, dotted; midtarsal segment 1 with complete basal ring. The single known specimen has the apex of the proboscis, palpi, antennae and segments 3-5 of hindtarsi broken; hindtarsal segments 1 and 2 have basal white rings.

MALE, PUPA, LARVA unknown.

SYSTEMATICS. The pattern of ornamentation of the single known adult of *argyrites* is so similar to that of *walkeri* that I have no hesitation in assigning *argyrites* to the Walkeri Group. The 2 forms are apparently differentiated primarily by the diagnostic characters given above but since the holotype of *argyrites* is damaged it is possible that additional differences may be present, especially in tarsal markings. A slide of male genitalia [USNM] from an unspecified locality in Venezuela (P.J. Anduze) probably represents another specimen of *argyrites*, as identified by W.H.W. Komp. There appear to be some differences between these and the male genitalia of *walkeri* but without additional material and the absence of the whole adult I hesitate to describe them at this time.

The exact type locality of *argyrites* is not known but the most likely place is somewhere in the Cordillera de la Costa in the state of Aragua, the origin of the bulk of the material collected by Nunez Tovar. Failure to find additional material of *argyrites* in this relatively well-known area suggests that *argyrites* may be a rare relict form.

BIONOMICS. The holotype was presumably obtained in a biting-landing collection. Immature stages of *argyrites* should be looked for in bromeliad axils, treeholes and broken bamboo, the known breeding sites of the closely related *walkeri*.

Aurites Group

FEMALES. *Head*: Narrow decumbent scales yellowish. Palpus with a few white scales on apex. *Thorax*: All light mesonotal lines golden, varied in development; lateral line sometimes moderately to rarely strongly broadened but not silvery. Acrostichal bristles not developed on disc. Scutellum with linear golden scales on lateral lobes. *Ssp* with or without scales; upper *stp* patch separate or united. *Legs*: Foretarsus completely dark; midtarsus with basal white markings on segments 1 or 1,2; hindtarsus with basal white markings on segments 1,2 or 1-3. *Abdomen*: Basomedian tergal light markings when present restricted to distal segments.

MALES. Palpus entirely dark. Larger claw of foreleg and midleg with small acute basal tooth and large submedian tooth; smaller claw with basal tooth only.

MALE GENITALIA. Claspette with a distinct outstanding apical fingerlike cylindrical process more than twice as long as wide and bearing a short apical bristle. Clasper about 0.5 of sidepiece; basal half with minute spicules; subapical hairs absent. Aedeagus subquadrate, slightly wider at middle, subequal to proctiger in length.

PUPAE. *Cephalothorax*: Hair 5-C at least 4-branched, moderately long but usually not reaching base of trumpet; hair 7-C with 3 or more branches; hair 10-C usually at least 10-branched. *Abdomen*: Hair 1-II-IV with many branches, 1-II with about as many branches as float hair (1-I); hair 2-II always mesad of hair 3; hair 5-IV,V usually double and about 1.5 of tergite following; hair 9-II-VI usually at level or slightly cephalad of hair 6; 9-VII subequal to hair 6-VII; hair 4-VIII double. *Paddle*: Moderate; practically unpigmented; apex rounded; marginal spicules indistinct.

LARVAE. *Head*: Hair 1-C unbranched; 4-C short; 5-C single or branched, long; 6-C at least 6-branched, moderate; none of ventral hairs stellate; 14-C single; 15-C short, not extending cephalad of base of mental plate. *Antenna*: Shaft with a few scattered spicules; hair 1-A spikelike, single. *Thorax*: Hair 13-P absent. Only hairs 0, 1,3,14-P and 5-T stellate, with a few, weakly barbed branches; hair 1-T far mesad of 2,3-T. *Abdomen*: Integument glabrous; all hairs except 0,8,14 at about same transverse level. Only hairs 2,5-I-VI, 11-I, 7-9-II-VI stellate, with a few weakly barbed branches; hairs 2 and 9 stronger than others; 9-I small, single; hair 8-VII distinctly cephalodorsad of 9-VII. *Segment VIII*: Comb scales in a single row; individual scales long and fringed to apex. *Siphon*: Index 5.0-8.5; integument glabrous; acus absent but base of siphon with small lateral indentation. Pecten not reaching middle of siphon; teeth long, without denticles. *Anal Segment*: Saddle body without distinct spicules except distally; caudal margin with row of long spines; hair 1-X always single and at lower end of caudal margin. Ventral brush with 6 pairs of hairs on a weak boss without grid bars.

DISCUSSION. The clearly marked Aurites Group shows a phenomenon unique in the subgenus: a flock of 4 sibling species sympatric in one small area. To date the group has been recognized only in Jamaica, where some of the species are quite common (fig.3).

There is a suggestion of some affinity of this group with the sympatric Walkeri Group in the general similarity in the mesonotal pattern of the adults. However, the immature stages of the 2 groups are very distinct. There is a much greater resemblance in the mesonotal pattern of the adults with the Sexlineatus Section except for the prescutellar line, and the larvae and pupae also resemble the Sexlineatus Section more than any group in the Walkeri Section. Although this resemblance may be entirely fortuitous, 2 more plausible explanations are possible. First, the Aurites Group might be the primitive stock of the Walkeri Section derived from the Sexlineatus Section; this is very unlikely since the entire Sexlineatus Section lacks several important primitive characters represented in other groups of the Walkeri Section (acrostichal bristles of the adults and comb scales in a patch in the larva). Second, the view held here; the Aurites Group may have been formed through relatively recent introgression between the Sexlineatus Section and the Walkeri Group. This interpretation would also account for the presence of a species flock in the Aurites Group, since such radiation usually takes place soon after a new phyletic line is established. It is also supported indirectly by the presence in Jamaica of several species in other genera that are either identical with or very closely related to Central American species, strongly suggesting a relatively recent connection between these areas.

No specific differences in the male genitalia of members of the group have been found and the adults of *inaequalis* and *stenei* cannot be separated from each other. In other respects the 4 species are readily differentiated from one another as indicated in the keys.

There appear to be some ecological barriers separating 2 of the species. *A. inaequalis* breeds in treeholes, broken bamboo and rockholes, largely at low elevations, and never in bromeliad axils, which are utilized exclusively by the other 3 species. *A. aurites* breeds primarily at elevations above 3,500 feet and has never been found associated with the other bromeliad-breeding members of the group. *A. grabhami* and *stenei* occur primarily below 2,500 feet but *grabhami* has been collected at elevations up to 4,000 feet. These 2 species are usually found associated in collections but it is not known if they occupy the same axils under natural conditions.

8. Aedes (Howardina) aurites (Theobald)

Figs.3,8,19,20

1907.*Howardina aurites* Theobald, 1907:216-218. TYPE: Lectotype ♀, Newcastle (St. Andrew), Jamaica, elev. 4000 ft, July 1906, Col. Loscombe [BM; selection of Belkin, 1968].

Aedes (Howardina) aurites in part of Dyar (1928:236); Edwards (1932:155); Lane (1939:99; 1953: 720-722); Horsfall (1955:471).

Aedes aurites of Howard, Dyar and Knab (1917:859-860); Dyar (1918:73); Johnson (1919:424); Gowdey (1926:73).

Aedes aurites in part of Hill and Hill (1948:29,42).

Howardina aurites of Theobald (1910:220); Surcouf and Gonzalez-Rincones (1911:139-140).

Aedes (Howardina) inaequalis in part of Thompson (1956:199-200); Stone, Knight and Starcke (1959:174); Belkin, Schick and Heinemann (1965:31); Forattini (1965:399,400).

Aedes inaequalis in part of Stone and Knight (1956:219).

FEMALE. Wing: 2.6 mm. Proboscis: 2.00 mm. Forefemur: 1.8 mm. Abdomen: about 2.7 mm. *Head*: Light decumbent scales golden on median stripe and short orbital line, yellowish on sides and venter. Erect scales yellowish, a few lateral ones darker. Palpus about 0.16 of proboscis. *Thorax* (fig.8): Mesonotal dark scales dense; light lines golden, moderately broad, wider than dark lines; inner dorsocentral line reaching to prescutellar space, followed by moderately broad median prescutellar line; outer dorsocentral line complete, merging with lateral marginal line anteriorly; lateral marginal line long, extending from side of anterior promontory to wingbase, very broad from scutal angle to wingbase due to presence of golden scales on antealar area above paratergite. Median scutellar lobe with a row of narrow golden scales flanked on sides by broad dark ones; lateral lobes with a few narrow, golden and black scales. *Apn* with a distinct silvery patch; *ssp* bare; patches on base of *pra*, upper and lower *stp* merged and continuous; rest of patches as in the section and group. *Legs*: Forefemur and midfemur predominantly dark anteriorly except for a few basal creamy scales, posterior surface and hindfemur predominantly creamy except for distal dark areas. Midtarsus with few white scales on segment 1; hindtarsus with short white rings on 1,2, rest dark scaled. *Haltere*: Stem pale, knob predominantly dark, fringe scales whitish. *Abdomen*: Basomedian tergal light scaling inconspicuous. Sternites II-IV straw yellow, V predominantly yellow with few apical dark scales; rest of segments with basal creamy and distal dark scales.

MALE. Wing: 2.34 mm. Proboscis: 2.16 mm. Forefemur: 1.71 mm. Essentially similar to female in coloration.

MALE GENITALIA (fig.19). As figured; diagnostic characters as in the key. Ninth tergite lobe indistinct, with 2 strong bristles. Sidepiece length about 3.0 median width. Clasper about 0.6 of sidepiece, basal 0.3 with minute spicules; spiniform short, about 0.25 of clasper.

PUPA (fig.19). Abdomen: 2.48 mm. Trumpet: 0.38 mm; index 6.0-6.2. Paddle: 0.7 mm. Readily separated from *inaequalis* and *stenei* by the absence of lightly pigmented area on metanotum and hair 9-C single; from *grabhami* by hair 2-VI laterad of 3-VI. *Cephalothorax*: Mesonotum and metanotum uniformly lightly pigmented; trumpets contrasting. Hair 1(1), 2(2, 1-2), 3(1, 1-2), 4(5, 3-8), 5(5, 4-7), 6(1, 1-2), 7(4, 4-6), 8(1), 9(1), 10(10, 9-16), 11(1), 12(3, 2-6). *Abdomen*: Tergite I uniformly lightly pigmented except for usual membranous areas; rest of segments light, pigmentation progressively lighter caudad. Segment I: hair 1(12-18 primary branches, each with many secondary ones), 2(1), 3(1), 4(6, 3-8), 5(6, 2-6), 6(1, 1-2), 7(2, 2-3), 9(1), 10(1, present in some). Segment II: hair 0(1), 1(37-56 branches, variable in different specimens), 2(1), 3(1), 4(4, 2-4), 5(1), 6(1), 7(4, 3-4), 9(1), 10(1, present in some). Segment III: hair 0(1), 1(14, 6-24), 2(1), 3(1, 1-3), 4(4, 2-4), 5(1), 6(1), 7(3, 2-4), 8(3, 2-4), 9(1, 1-2), 10(2, 2-3), 11(1), 14(1). Segment IV: hair 0(1), 1(8, 5-16), 2(1, 1-2), 3(4, 3-6), 4(2, 1-4), 5(1, 1-3), 6(1), 7(3, 2-5), 8(2, 1-3), 9(1), 10(2, 2-4), 11(1), 14(1). Segment V: hair 0(1), 1(2, 1-7), 2(1, 1-2), 3(2, 2-3), 4(5, 3-8), 5(1), 6(1), 7(4, 2-6), 8(2, 1-3), 9(1), 10(1, 1-2), 11(1), 14(1). Segment VI: hair 0(1), 1(1, 1-6), 2(1), 3(2, 1-3), 4(4, 2-6), 5(2, 1-5), 6(1, 1-3), 7(1), 8(3, 1-8), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1, 1-2), 4(2, 1-2), 5(1, 1-2), 6(2, 2-4), 7(1, 1-2), 8(3, 2-4), 9(3, 2-4), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(2), 9(10, 8-12), 14(1). *Paddle*: Almost without pigmentation; midrib faintly pigmented; external margin smooth. Male genital lobe extending to 0.42 of paddle, female genital lobe to 0.27.

LARVA (fig.20). Head: 0.73 mm. Siphon: 0.97 mm. Anal Saddle: 0.24 mm. Readily separated from *stenei* by hair 2-VII small and single; from *inaequalis* by the longer subequal gills and at least 3-branched hair 5-C; from *grabhami* by the 3-branched hair 5-C. Chaetotaxy as given below, hairs moderately pigmented. *Head*: Width about 1.18 of length; pigmentation light, deeper around mouthparts and behind ocular area ventrally. Mental plate with a strong median tooth and 10 distinct teeth on either side. Hair 0(1), 1(1), 3(1), 4(4, 4-5), 5(3, 2-4), 6(10, 9-13), 7(6, 4-7), 8(1), 9(3, 2-3), 10(1), 11(3, 3-5), 12(1, 1-2), 13(1), 14(1, small), 15(3, 3-4). *Antenna*: Length about 0.44 of head, very lightly pigmented and with few scattered spicules. All hairs single; hair 1-A about 0.5 from base. *Thorax*: Long hairs attenuate apically and weakly barbed; stellate hairs with a few weakly barbed branches. Prothorax: hair 0(11, 8-14), 1(9, 9-11), 2(1), 3(13, 12-14), 4(1), 5(2, 2-3), 6(1), 7(1, 1-2), 8(8, 8-12), 9(2, 1-3), 10(1), 11(4, 2-5), 12(1), 14(16, 11-19). Mesothorax: hair 1(5, 3-6), 2(1), 3(1), 4(1), 5(1), 6(5, 4-6), 7(1), 8(7, 6-8), 9(8, 6-9), 10(1), 11(2, 1-3), 12(1), 13(10, 6-16), 14(5, 5-9). Metathorax: hair 1(2, 1-4), 2(1), 3(4, 3-5), 4(7, 3-9), 5(9, 6-10), 6(1), 7(7, 6-9), 8(4, 3-5), 9(5, 4-7), 10(1), 11(2, 1-2), 12(1), 13(7, 4-7). *Abdomen*: Stellate hairs as on thorax. Segment I: hair 1(3, 2-3), 2(7, 6-8), 3(1), 4(4, 2-5), 5(7, 7-10), 6(3, 3-4), 7(1), 9(1, 1-2), 10(1), 11(7, 6-9), 13(5, 3-6). Segment II: hair 0(1), 1(2, 1-3), 2(7, 6-8), 3(1), 4(2, 2-4), 5(9, 7-10), 6(3), 7(3, 2-4), 8(1, 1-2), 9(6, 3-7), 10(1), 11(1), 12(1), 13(3, 3-5). Segment III: hair 0(1), 1(2, 2-3), 2(6, 5-8), 3(1), 4(2, 2-3), 5(10, 8-10), 6(1, 1-2), 7(5, 4-7), 8(1), 9(6, 5-6), 10(1), 11(1), 12(1), 13(5, 3-6), 14(1). Segment IV: hair 0(1), 1(2, 2-3), 2(7, 6-7), 3(1), 4(2, 2-3), 5(10, 8-11), 6(1, 1-2), 7(4, 4-8), 8(1, 1-2), 9(6, 5-7), 10(1), 11(1), 12(1), 13(5, 4-6), 14(1). Segment V: hair 0(1), 1(2), 2(6, 5-7), 3(1), 4(2, 2-5), 5(9, 7-10), 6(1), 7(3, 3-5), 8(1, 1-2), 9(6, 5-6), 10(1), 11(1), 12(1), 13(5, 4-7), 14(1). Segment VI: hair 0(1), 1(2), 2(5, 4-6), 3(1), 4(1), 5(6, 5-9), 6(1), 7(2, 2-3), 8(3, 1-3), 9(4, 4-6), 10(1), 11(1), 12(1), 13(7, 5-8), 14(1). Segment VII: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1), 5(3, 2-4), 6(3, 2-3), 7(1), 8(6, 4-7), 9(3, 2-3), 10(1), 11(1), 12(1), 13(3, 2-5), 14(1). *Segment VIII*: Comb scales in a single row, 18(16-19) in number; individual scale long and fringed uniformly to apex. Hair 0(1), 1(4, 3-5), 2(1), 3(6, 4-6), 4(1), 5(2, 2-3), 14(1). *Siphon*: Index about 6.0-6.5; moderately pigmented, with darker basal ring. Pecten extending to about 0.45, with 19(14-21) teeth; proximal teeth smooth, distal with a few apical spinules. Hair 1(2, 2-3), 2(1), 3-5 not visible, 6(1), 7(1), 8(2, 1-3), 9(1). *Anal Segment*: Saddle moderately pigmented; caudal margin with spines of varying sizes. Gills subequal, long, about 2.0 of saddle length. Hair 1(1), 2(5, 4-7), 3(1), 4a(4, 4-5), 4b(4), 4c(4, 3-5), 4d(4, 3-5), 4e(4, 3-4), 4f(3, 2-4).

SYSTEMATICS. *A. aurites* is undoubtedly a distinct species erroneously synonymized by Thompson (1956:199) with *inaequalis*. It is readily differentiated in the adult stage from all the other members of the group, as pointed out by Theobald (1907:217) in the original description, by the large continuous silvery patch on *ssp*. There are other diagnostic features in the adults as indicated above and the immature stages are readily separated from the other members of the group.

There is no striking variation in adult ornamentation in the small series of specimens examined and the diagnostic characters of the immature stages are quite constant.

BIONOMICS. The immature stages of *aurites* have been found only in arboreal bromeliads, in my experience generally at elevations of more than 3,500 feet and never in association with *grabhami* or *stenei*, the other bromeliad-breeding members of the Aurites Group. It appears that this species occurs at lower elevations at least occasionally as Thompson reared several adults from larvae collected at Hope Farm [USNM] at an elevation of 1,000 feet in 1946, and 2 females (JA 702) were caught recently (1967) near Kingston at elevations of about 1,000-1,500 feet. Females have been collected biting humans during the day but no attempt has been made to study their activity cycle. From the available data, *aurites* appears to have a restricted geographic range, having been collected only from the parishes of Manchester and St. Andrew.

DISTRIBUTION (fig.3). Endemic to the island of Jamaica where it has been reported from the parishes of Manchester, St. Andrew and Kingston, primarily at elevations of 3400 to 5250 ft. Material examined: 145 specimens; 24 ♂, 33 ♀, 44 pupae, 44 larvae; 36 individual rearings (22 pupal, 7 larval, 7 incomplete).

JAMAICA. *Manchester*: Hope Farm, 1 Jan 1946, G.A. Thompson, 2 lp♂ (460101-24,26), 1 l♂ (460101-30), 1 lp♀ (460101-27), 1 lp (460101-15); 1 Oct 1946, G.A. Thompson, 1 p (461001-1) [USNM]. *St. Andrew and Kingston*: Cinchona Gardens, elev. 4000-5250 ft, 8 Sept 1965, J.N. Belkin, 1 ♂ (JA 341); 24 Aug 1967, W.A. Page, 3 L (JA 752) [UCLA]. Ferry River, 4 Aug 1967, W.A. Page, 2 ♀ (JA 702) [UCLA]. Hardwar Gap, elev. 3800 ft, 1 lp♂ (647-20), 2 p♂ (647-110,111) [UCLA]. Kingston, July 1905, M. Grabham, 1 ♀ [USNM]. Newcastle, elev. 4000 ft, 5 Sept 1964, W.A. Page (JA 125), 1 lp♀ (125-10), 2 p♂ (125-102,106), 7 p♀ (125-100,101,103-105,107,114), 1 lP (125-11), 1 ♂, 7 ♀, 4 L; track to Catherines Peak, elev. 4000-4300 ft, 8 Nov 1966, O.G.W. Berlin, 2 p♂ (677-101,102), 1 p♀ (677-100), 5 ♀ (JA 679), 2 p♂ (680-110,111), 1 p♀ (680-112), 3 ♂, 1 P (JA 680), 1 lp♂ (681-10), 1 p♂ (681-100), 1 ♂, 2 ♀, 2 p, 7 L (JA 681), 1 p♂ (682-101), 3 p♀ (682-100,102,103), 3 lP (682-10-12), 3 ♂, 5 P, 13 L, 2 l (JA 682). Uester Road, elev. 3400-4500 ft, 8 Sept 1965, J.N. Belkin, 2 lP (337-12,13), 1 ♂, 1 ♀ (JA 337), 1 L (JA 338) [UCLA].

9. Aedes (Howardina) grabhami Berlin, n.sp.

Figs.3,7,8,21,22

TYPES: Holotype ♂ (JA 688-20) with associated pupal and larval skins and genitalia slide, near Hope Farm, Porus, Manchester, Jamaica, elev. 1000 ft, 12 Nov 1966, O.G.W. Berlin [USNM]. Allotype ♀ (JA 688-11) with associated pupal and larval skins, same data as holotype [USNM]. Paratypes: 11 ♂ (JA 688-13,100,101,107,108,111,114-116,126,128), 14 ♀ (JA 688-12,15,102,103, 110,113,120-123,129-132), 1 lP (JA 688-16), 1 ♂, 5 p, 8 L, 1 l, same data as holotype [USNM, BM, UCLA].

1906.*Howardina aureostriata* Grabham, 1906:171-173. TYPES: ♂, ♀, larva, Newcastle (St. Andrew), Jamaica, elev. 4000 ft, Sept 1905, Loscombe and Maclaverty [NE].

Aedes (Howardina) aureostriata in part of Bonne and Bonne-Wepster (1925:370-371).
Aedes aureostriata of Gowdey (1926:73).

Aedes aureostriata in part of Howard, Dyar and Knab (1917:855-859); Dyar (1918:73,80).
Howardina aureostriata of Theobald (1910:609-611).
Haemagogus aureostriata of Dyar and Knab (1906a:166,167).
Aedes (Howardina) inaequalis in part of Thompson (1947:78; 1956:199-200); Stone, Knight and Starcke (1959:174); Belkin, Schick and Heinemann (1965:31); Forattini (1965:399,400).
Aedes inaequalis in part of Stone and Knight (1956:219).
Aedes (Howardina) aurites in part of Dyar (1928:236); Edwards (1932:155); Lane (1939:99; 1953:720-722); Horsfall (1955:471).
Aedes aurites in part of Hill and Hill (1948:29,42).

FEMALE. Wing: 2.15 mm. Proboscis: 1.68 mm. Forefemur: 1.33 mm. Abdomen: about 2.1 mm. Essentially similar to *aurites*, differing mainly in the following. *Head*: Erect scales entirely dark. *Thorax* (fig.8): Mesonotal dark scales not as dense as in *aurites*; light lines usually distinctly narrower than in *aurites*, in a few specimens broader than in *aurites* and rarely almost completely fused; outer dorsocentral line usually distinctly shorter, not merging with lateral marginal line anteriorly, in a few specimens merging with lateral marginal line; lateral marginal line long, moderately broad, extending from side of anterior promontory to wingbase. Antealar area above paratergite predominantly with scattered golden and a few bronzy scales. Lateral scutellar lobes with a few narrow golden scales only. *Apn* with a moderate silvery patch; *ssp* with a distinct silvery patch. Patches on base of *pra*, upper and lower *stp* distinct, separate. *Legs*: Midtarsus with few white scales on segments 1,2; hindtarsus with moderate white rings on 1-3. *Haltere*: Stem pale, knob predominantly white but with a few dark scales dorsally. *Abdomen*: Sternites II,III straw yellow, IV predominantly straw yellow, a few apical scales dark; rest of segments with basal yellow and distal dark scales.

MALE. Wing: 2.21 mm. Proboscis: 1.75 mm. Forefemur: 1.31 mm. Essentially similar to female in color.

MALE GENITALIA (fig.21). As figured; diagnostic characters as in the key. Ninth tergite lobe indistinct, with 2 strong bristles. Sidepiece length about 3.0 median width. Clasper length 0.65 of sidepiece, basal 0.33 with minute spicules; spiniform about 0.2 of clasper.

PUPA (fig.21). Abdomen: 2.75 mm. Trumpet: 0.38 mm; index 4.6-4.8. Paddle: 0.69 mm. Chaetotaxy as given below, hairs moderately pigmented. Readily separated from *inaequalis* and *stenei* by the absence of lightly pigmented area on metanotum and abdominal segments uniformly lightly pigmented; from *aurites* by the hair 2-VI distinctly mesad or at level of 3-VI. *Cephalothorax*: Mesonotum and metanotum lightly pigmented. Hair 1(1), 2(2, 2-3), 3(1), 4(7, 4-8), 5(5, 4-7), 6(1, 1-2), 7(4, 3-5), 8(1, 1-3), 9(1, 1-2), 10(22, 18-32), 11(1), 12(5, 3-6). *Abdomen*: Lightly pigmented, progressively lighter caudad. Segment I: hair 1(12-16 primary branches, subequal in length with many secondary branches), 2(2, 1-3), 3(1), 4(8, 6-8), 5(8, 4-8), 6(1, 1-2), 7(4, 3-4), 9(1), 10(1), 11(1). Segment II: hair 0(1), 1(60, 50-74), 2(1), 3(1), 4(5, 4-6), 5(1), 6(1), 7(5, 4-6), 9(1). Segment III: hair 0(1), 1(13, 8-17), 2(1), 3(1, 1-3), 4(4, 3-6), 5(1), 6(1), 7(4, 3-6), 8(4, 2-4), 9(1), 10(2, 2-3), 11(1), 14(1). Segment IV: hair 0(1), 1(9, 8-14), 2(1), 3(4, 4-6), 4(4, 2-4), 5(1), 6(1), 7(4, 3-6), 8(2, 1-4), 9(1), 10(2, 1-2), 11(1), 14(1). Segment V: hair 0(1), 1(1), 2(1), 3(2, 1-3), 4(4, 4-7), 5(1), 6(1), 7(5, 4-6), 8(2, 2-3), 9(1), 10(1, 1-2), 11(1), 14(1). Segment VI: hair 0(1), 1(1, 1-2), 2(1, 1-2), 3(2, 1-2), 4(4, 3-4), 5(1), 6(1), 7(1), 8(2, 2-3), 9(1), 10(1, 1-2), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(2, 1-2), 4(2), 5(1), 6(2, 2-5), 7(1), 8(3, 2-4), 9(2, 2-4), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(2, 1-2), 9(10, 8-11), 14(1). *Paddle*: Almost without pigmentation, midrib faintly pigmented. Male genital lobe extending to 0.42 of paddle, female genital lobe to 0.35.

LARVA (fig.22). Head: 0.7 mm. Siphon: 0.92 mm. Anal Saddle: 0.22 mm. Chaetotaxy as given below, hairs lightly to moderately pigmented. Readily separated from *stenei* by the small and single hair 2-VII; from *aurites* by hair 5-C always single; from *inaequalis* by hair 5-C single and longer, narrow gills. *Head*: Width about 1.14 of length. Mental plate with a strong median tooth and 10 distinct teeth (9-12) on each side, often a small detached tooth at base. Hair 0(1), 1(1), 3(1), 4(3, 2-5), 5(1), 6(6, 5-10), 7(3, 2-3), 8(1), 9(2, 2-3), 10(2, 1-2), 11(2, 1-7), 12(2, 2-4), 13(1), 14(1), 15(3, 2-4). *Antenna*: Length about 0.49 of head, very lightly pigmented and with a few scattered spicules. Hair 1-A at about 0.46 from base. *Thorax*: Stellate hairs with a few, weakly barbed branches; long hairs barbed, with attenuate apices. Prothorax: hair 0(7, 4-12), 1(6, 5-9), 2(1), 3(13, 8-19), 4(1, 1-2), 5(2, 1-2), 6(1), 7(1), 8(2, 2-11), 9(2, 1-2), 10(1), 11(2, 2-4), 12(1), 14(13, 9-22). Mesothorax: hair 1(2, 2-13), 2(1), 3(1), 4(1), 5(1), 6(4, 2-6), 7(1), 8(5, 4-7), 9(7, 6-8), 10(1), 11(2, 1-2), 12(1), 13(4, 2-4), 14(5, 4-7). Metathorax: hair 1(2, 1-12), 2(1), 3(4, 2-5), 4(2, 2-10), 5(5, 5-14), 6(1), 7(7, 6-8), 8(5, 4-8), 9(6, 6-9), 10(1), 11(2), 12(1), 13(4, 3-10). *Abdomen*: Long and stellate hairs as on thorax. Segment I: hair 1(3, 2-14), 2(6, 6-14), 3(1), 4(4, 3-4), 5(4, 4-12), 6(3), 7(1), 9(1), 10(1), 11(5, 5-11), 13(4, 4-11). Segment II: hair 0(1), 1(2, 2-12), 2(5, 5-13), 3(1), 4(2, 2-4), 5(7, 5-14), 6(3, 2-3), 7(2, 2-3), 8(1), 9(5, 5-9), 10(1), 11(1), 12(1), 13(3, 2-8). Segment III: hair 0(1), 1(2, 2-3), 2(5, 5-11), 3(1), 4(2, 2-3), 5(7, 5-12), 6(1, 1-2), 7(6, 3-7), 8(1), 9(5, 4-9), 10(1), 11(1), 12(1), 13(2, 2-8), 14(1). Segment IV: hair 0(1), 1(2, 1-3), 2(5, 5-12), 3(1), 4(2, 2-3), 5(6, 6-14), 6(1), 7(6, 5-7), 8(1), 9(5, 5-9), 10(1), 11(1), 12(1), 13(3, 3-8), 14(1). Segment V: hair 0(1), 1(2, 2-3), 2(5, 5-10), 3(1), 4(4, 3-5), 5(5, 4-13), 6(1), 7(6, 3-7), 8(1), 9(5, 5-7), 10(1), 11(1), 12(1), 13(3, 2-8), 14(1). Segment VI: hair 0(1), 1(2, 1-3), 2(4, 4-8), 3(1), 4(1), 5(2, 2-9), 6(1), 7(3, 2-5), 8(3, 2-3), 9(3, 2-7), 10(1), 11(1), 12(1), 13(3, 2-11), 14(1). Segment VII: hair 0(1), 1(2, 1-2), 2(1), 3(1), 4(1), 5(3, 2-3), 6(3, 2-5), 7(1), 8(5, 5-10), 9(1, 1-2), 10(1), 11(1), 12(1), 13(1, 1-3), 14(1). *Segment VIII*: Comb scales 16(15-19), moderately pigmented, elongate, fringed on sides and apex. Hair 0(1), 1(3, 3-4), 2(1), 3(5, 4-7), 4(1), 5(2, 2-5), 14(1). *Siphon*: Index about 6.8-8.5; moderately pigmented, with darker basal ring. Pecten extending to about 0.44; teeth 17(14-22). Hair 1(2, 2-3), 2(1), 3-5 not visible, 6(1), 7(1), 8(2, 1-2), 9(1). *Anal Segment*: Saddle moderately pigmented. Gills narrow, length about 1.5 of saddle, ventral 0.8 of dorsal. Hair 1(1), 2(5, 5-8), 3(1), 4a(5, 4-7), 4b(5, 4-5), 4c(4, 3-5), 4d(4, 4-5), 4e(4, 2-6), 4f(3, 2-4).

SYSTEMATICS. Although it is almost certain that *grabhami* represents the same taxon as *aureostriatus* Grabham, 1907, which is preoccupied in *Aedes* by *aureostriatus* (Doleschall, 1857) and *aureostriatus* (Leicester, 1908), I am proposing it as a new species and not as a replacement name for *aureostriatus* because the types of the latter are lost and therefore the identity of this nominal taxon cannot be objectively determined. This species was believed to be identical with *inaequalis* and *aurites* by Thompson (1956) who used the former name because of priority. *A. grabhami* is readily differentiated from the other species of the Aurites Group in all stages by the characters indicated in the diagnosis and keys.

There is considerable variation in the ornamentation of adults of *grabhami*. The majority have distinct golden mesonotal lines, broader than in *inaequalis* and *stenei* and narrower than in *aurites*; a few have these lines narrower than in *inaequalis* or *stenei*. The most striking departure is found in a few specimens with the mesonotum almost completely golden except for a few dark scales in indistinct narrow longitudinal lines; in these the hindtarsal light markings are restricted to segments 1 and 2. I have retained these specimens under *grabhami* on the basis of similarity in other diagnostic features but their exact taxonomic status is doubtful. They may represent a distinct species or possibly hybrids between typical *grabhami* and *stenei* which have been found in the same collections. There is also considerable variation in the chaetotaxy of the larvae, some being much more "hairy" than others; however, the diagnostic characters given above apply to all the material I have seen.

BIONOMICS. The immature stages of *grabhami* are found in both terrestrial and epiphytic bromeliads. *A. stenei* is frequently associated with *grabhami* in the same bromeliads but it is not known if the 2 species actually occupy the same axils. I did not find *grabhami* above 1,800 feet elevation but the original material of *aureostriatus* is reported to have been collected at an altitude of about 4,000 feet. *A. grabhami* is, next to *stenei*, the most common member of the Aurites Group and has been reported from all parishes of Jamaica except Westmoreland, Trelawny and St. Elizabeth. Females were found to bite humans along with *stenei* and *inaequalis* and showed the same small peak of biting activity at 1700 hrs, as the latter (fig.7).

DISTRIBUTION (fig.3). Endemic to the island of Jamaica where it has been reported from all parishes except Westmoreland, Trelawny and St. Elizabeth at elevations of 100 ft to 1800 ft. Material examined: 1223 specimens; 172 ♂, 385 ♀, 373 pupae, 293 larvae; 298 individual rearings (198 pupal, 69 larval, 31 incomplete).

JAMAICA. *Clarendon*: Belcarres, 7 Nov 1967, W.A. Page (JA 902), 1 p♂ (902-101), 1 p♀ (902-102), 3 L [UCLA]. *Hanover*: Lethe, elev. 500 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson, 2 L (JA 667) [UCLA]. *Manchester*: Hope Farm, 8 July 1945, G.A. Thompson, 1 lp♂ (450708-2), 2 lp♀ (450708-9,11), 1 lp (450708-7), 1 1 (450708-8); 1 Aug 1945, G.A. Thompson, 1 l♂ (450801-12), 1 ♀ (450801-12), 2 1 (450801-6,8); 1 Oct 1945, G.A. Thompson, 2 lp♂ (451001-6,9), 1 l♂ (451001-1), 1 lp (451001-14); Oct 1945, 3 L; 1 Jan 1946, G.A. Thompson, 2 lp♀ (460101-4,12), 1 ♂ (460101-15); 8 Jan 1946, 1 ♂, 1 ♀ [USNM]; elev. 1000-1100 ft, 10 Sept 1965, W.A. Page, 1 lp♀ (354-12), 2 p♂ (354-105,106), 3 p♀ (354-103,104,107), 1 ♂ (JA 355), 1 ♀ (JA 356); 12 Nov 1966, O.G.W. Berlin, 210 ♀ (JA 684), 2 p♂ (686-100,102), 1 p♀ (686-101), 2 lp♀ (687-11,12), 5 p♂ (687-100-104), 1 lP (687-10), 1 P (JA 687), 2 lp♂ (688-13,20), 3 lp♀ (688-11,12,15), 10 p♂ (688-100, 101,107,108,111,114-116,126,128), 12 p♀ (102,103,110,113,120-123,129,130-132), 1 lP (688-16), 1 ♂, 5 p, 8 L, 1 1 (JA 688, type series) [UCLA]. Mandeville, 5 Mar 1928, Pickering, 5 ♀ [USNM]. Porus, elev. 900-1000 ft, 23 Oct 1966, O.G.W. Berlin and D.C. Watson, 1 lp♂ (630-11), 1 lp♀ (630-10), 1 L (JA 630), 4 p♂ (631-105,106,109,112), 2 p♀ (631-108,113), 2 ♀, 1 P, 2 p, 1 L, 1 1 (JA 631), 2 lp♂ (632-10,12), 1 lp♀ (632-11), 6 p♂ (632-101,103,104,108,112,114), 5 p♀ (632-100,102, 105-107), 2 lP (632-13,15), 1 P, 2 p, 19 L, 2 1 (JA 632); 1 Nov 1966, O.G.W. Berlin, 1 lp♂ (655-10), 6 p♂ (655-101,103,105-107,109), 4 p♀ (655-100,104,108,111), 4 lP (655-11-14), 4 L, 6 1 (JA 655), 2 L (JA 656), 2 p♂ (658-110,114), 4 p♀ (658-103,107,112,113), 1 ♂, 1 p, 1 L, 1 1 (JA 658) [UCLA]. *Portland*: Kemney-Sherwood Forest, elev. 750 ft, 12 Aug 1967, J.N. Belkin and W.A. Page, 1 lp♂ (706-11), 1 p♀ (706-100), 1 p (JA 706), 2 lp♀ (708-13,16), 1 p♂ (708-11), 1 lp (708-14), 1 ♀ (JA 708) [UCLA]. *St. Andrew and Kingston*: Hermitage Dam Road, 1 Sept 1965, W.A. Page (JA 319), 1 lp♀ (319-105); 17 Aug 1967, J.N. Belkin and W.A. Page, 2 lp♂ (723-21,23), 1 lp♀ (723-24), 1 lP (723-20), 2 p♀ (725-113A,114), 1 ♂, 1 P (JA 725); 5 July 1967, W.A. Page and J.N. Belkin (JA 765), 1 p♂ (765-100); 25 Aug 1967, W.A. Page (JA 854), 1 lp♂ (854-13), 2 p♂ (854-105,106), 1 p♀ (854-107), 2 lP (854-15,16), 2 L; 5 Aug 1967, W.A. Page and J.N. Belkin (JA 892), 4 lp♂ (892-10,13,15,16), 3 lp♀ (892-11,12,14), 2 p♂ (892-100,104), 3 P, 1 L [UCLA]. Kingston, M. Grabham, 1 ♂ [USNM]. *St. Ann*: Moneague, 17 Aug 1967, J.N. Belkin and W.A. Page (JA 733), 1 p♂ (733-105), 4 p♀ (733-40,90,96,114), 2 ♂, 1 P, 6 p, 3 L, 1 1 [UCLA]; Faiths Pen Schoolyard, elev. 1750 ft, 31 Aug 1967, W.A. Page (JA 762), 2 p♂ (762-100,101), 1 ♂, 1 ♀, 1 P, 1 1 [UCLA]; 2.0 mi S of Moneague near Unity, elev. 1750 ft, 25 Aug 1967, W.A. Page (JA 758), 6 p♂ (758-100, 103,104,109,110,113), 2 p♀ (758-30,101), 1 ♂, 2 ♀, 3 p [UCLA]; 29.0 mi S of Moneague, elev. 1750 ft, 30 Aug 1967, W.A. Page, 1 ♂, 2 ♀, 4 P, 3 1 (JA 763), 2 lp♂ (764-10,12), 1 lp♀ (764-30), 9 p♂ (764-91,94,95,99 103-106,109), 5 p♀ (764-92,98,100,102,108), 2 ♂, 1 ♀, 8 P, 6 p, 21 L (JA 764) [UCLA]; Moneague-Claremont Road, 17 Sept 1965, W.A. Page, 1 lp♂ (375-12), 1 lp♀ (375-13), 1 p♀ (375-100), 7 ♀ (JA 375), 1 p♂ (378-100), 1 p♀ (378-101), 1 lP (378-13), 1 lp♂ (380-12), 4 lp♀ (380-10,11,13,17A), 3 p♂ (380-101,104,105), 2 p♀ (380-100,107), 5 lP (380-14,15,17,18, 20) [UCLA]; Moneague-Ocho Rios Road, 10 Sept 1967, W.A. Page (JA 776), 1 p♀ (776-101) [UCLA]. Mt. Diablo, 17 Sept 1965, W.A. Page (JA 376), 1 lp♀ (376-12); 17 Aug 1967, J.N. Belkin and W.A. Page, 6 lp♂ (731-21,33,35-38), 1 lp♀ (731-31), 9 p♂ (731-90,92,93,105,108-112), 12 p♀ (731-80,81,91,94,97,99,103-107,113), 2 lP (731-30,34), 11 ♂, 7 ♀, 2 P, 17 p, 24 L (JA 731), 1 lp♂ (732-10), 10 p♂ (732-70,94,97,100-102,104,111,112,114), 6 p♀ (732-90,92,93,105,107,108), 1 ♀, 1 P, 3 p, 5 L, 2 l (JA 732), 4 lp♂ (733-13-16), 1 p♂ (733-100), 1 lP (733-11), 12 L (JA 733), 1 p♂ (734-102), 2 p♀ (734-101,105), 2 P, 1 L (JA 734), 1 ♀ (JA 735) [UCLA]. *St. Elizabeth*: Darlington, 28 Oct 1967, W.A. Page, 1 p, 4 L (JA 901) [UCLA]. *St. James*: Five Miles, elev. 100 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson (JA 676), 1 lp♀ (676-11), 2 p♂ (676-115,121), 6 p♀ (676-104,107,112,113,116,123), 1 lP (676-17), 1 ♂, 1 ♀, 3 p, 2 L [UCLA]. Montego Bay, elev. 500 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson (JA 669), 1 lP (669-11) [UCLA]. Reading, elev. 200 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson, 1 l (JA 670) [UCLA]. *St. Mary*: Broadgate, elev. 500 ft, 27 Oct 1966, O.G.W. Berlin and D.C. Watson (JA 643), 2 lp♂ (643-33,43), 1 lp♀ (643-37), 1 L, 1 l [UCLA]. Leith Hall, 13 Nov 1966, O.G.W. Berlin and D.C. Watson, 4 L (JA 689) [UCLA]. Windsor Forest, elev. 750 ft, 30 Oct 1966, O.G.W. Berlin and D.C. Watson, 1 lp♀ (650-22), 4 p♂ (650-100-102,105), 2 lP (650-20,23), 1 ♂, 6 P, 3 L (JA 650), 1 lP (651-34), 2 lp♀ (652-10,12), 4 p♂ (652-100,102,103,110), 4 p♀ (652-101,104,108,111), 2 lP (652-14,15), 11 L, 1 l (JA 652) [UCLA]. *Parish not specified*: 1944, R.B. Hill, 1 ♂; 1 Jan 1946, G.A. Thompson, 7 L; M. Grabham, 1 lp; G.A. Thompson, 1 ♂, 2 ♀ [USNM]; W.A. Page, 2 p♂ (771-101,106), 4 L (JA 771), 2 lp♀ (772-33, 34), 8 p♂ (772-90,93,95,97,99,106,110,114), 11 p♀ (772-91,92,96,98,101,103,104,107,108,111, 113), 1 lp (772-30), 3 ♂, 6 ♀, 5 P, 11 p, 40 L, 1 l (JA 772) [UCLA].

10. Aedes (Howardina) inaequalis (Grabham)

Figs.3,7,8,23,24

1907.*Howardina inaequalis* Grabham, 1907:25-26. TYPE: Lectotype ♂ with genitalia slide, Kingston (St. Andrew), Jamaica, date not specified, M. Grabham [USNM; selection of Stone and Knight 1956:219].

Aedes (Howardina) inaequalis in part of Thompson (1947:78; 1956:199-200); Stone, Knight and Starcke (1959:174); Belkin, Schick and Heinemann (1965:31); Forattini (1965:399,400); Porter (1967:38).

Aedes inaequalis in part of Stone and Knight (1956:219).

Howardina inaequalis of Theobald (1910:611); Surcouf and Gonzalez-Rincones (1911:141).

Aedes (Howardina) aurites in part of Dyar (1928:236); Edwards (1932:155); Lane (1939:99; 1953:720-722); Horsfall (1955:471).

Aedes aurites in part of Hill and Hill (1948:29,42).

Aedes (Howardina) aureostriata in part of Bonne and Bonne-Wepster (1925:370-371).

Aedes aureostriata in part of Howard, Dyar and Knab (1917:855-859); Dyar (1918:73,80).

FEMALE. Wing: 2.37 mm. Proboscis: 1.93 mm. Forefemur: 1.49 mm. Abdomen: about 2.1 mm. Similar to *aurites*, differing primarily in the following. *Head*: Erect scales dark. *Thorax* (fig.8): Mesonotal dark scales not dense as in *aurites*; mesonotal light lines narrow, faintly golden, distinctly narrower than dark lines; outer dorsocentral line shorter, not merging with lateral marginal line anteriorly. Lateral marginal line narrow from side of anterior promontory to wingbase. Antealar area above paratergite with scattered dark scales only. Lateral scutellar lobes with a few narrow golden scales. *Apn* with a restricted silvery patch, distinctly smaller than in *aurites* and *grabhami; ssp* with a distinct silvery patch; patches on base of *pra*, upper and lower *stp* distinct, separate. *Legs*: Midtarsus with a few white scales on segments 1,2; hindtarsus with broader white rings on 1-3. *Haltere*: Stem pale, knob predominantly white, with a few dark scales dorsally. *Abdomen*: Basomedian tergal straw yellow patches on V-VII.

MALE. Wing: 2.36 mm. Proboscis: 2.01 mm. Forefemur: 1.58 mm. Essentially similar to female in coloration.

MALE GENITALIA (fig.23). Diagnostic characters as in the key. Ninth tergite lobe not prominent, with 2,3 bristles. Sidepiece length about 2.5 median width. Clasper length about 0.55 of sidepiece; spiniform short, about 0.25 of clasper.

PUPA (fig.23). Abdomen: 3.08 mm. Trumpet: 0.46 mm; index 5.0-5.6. Paddle: 0.68 mm. Chaetotaxy as given below, hairs lightly to moderately pigmented. Very similar to *stenei* but apparently distinguishable by the moderately pigmented abdominal tergite II and segment III only slightly darkened in the middle, without distinct dark stripe. Readily separated from *aurites* and *grabhami* by the lightly pigmented area on the metanotum. *Cephalothorax*: Mesonotum moderately pigmented between trumpets; lateral area slightly darker; metanotum with a small to moderate, lightly pigmented area in the middle of lateral portion. Hair 1(1), 2(2, 1-3), 3(1, 1-3), 4(4, 2-7), 5(6, 3-7), 6(1, 1-2), 7(4, 3-6), 8(1, 1-2), 9(2, 2-3), 10(15, 6-15), 11(1), 12(4, 2-5). *Abdomen*: Tergite I moderately pigmented except for usual membranous areas; tergites II,III moderately pigmented; other segments lighter. Segment I: hair 1(11-14 primary branches, subequal in length, each with many secondary branches), 2(1, 1-2), 3(1), 4(5, 4-7), 5(5, 4-6), 6(1), 7(3, 2-3), 9(1), 10(1, present in some), 11(1, present in some). Segment II: hair 0(1), 1(40, 36-56), 2(1), 3(1), 4(4, 4-8), 5(1), 6(1), 7(4, 3-4), 9(1), 10(2, 2-3, present in a few). Segment III: hair 0(1), 1(9, 9-20), 2(1), 3(1), 4(4, 2-4), 5(1), 6(1), 7(4, 2-5), 8(3, 2-3), 9(1), 10(2), 11(1), 14(1). Segment IV: hair 0(1), 1(6, 3-14), 2(1), 3(4, 3-7), 4(2, 2-3), 5(1, 1-2), 6(1), 7(3, 2-4), 8(2, 1-2), 9(1), 10(2, 1-2), 11(1), 14(1). Segment V: hair 0(1), 1(1, 1-4), 2(1), 3(2, 1-3), 4(6, 3-7), 5(1, 1-2), 6(1), 7(5, 3-7), 8(2, 1-3), 9(1), 10(1, 1-2), 11(1), 14(1). Segment VI: hair 0(1), 1(1, 1-3), 2(1), 3(1, 1-3), 4(3, 2-7), 5(1, 1-2), 6(1, 1-2), 7(1, 1-2), 8(3, 2-4), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1), 4(2, 1-3), 5(1), 6(3, 2-4), 7(1, 1-3), 8(3, 1-5), 9(4, 3-5), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(2, 1-2), 9(9, 8-12), 14(1, 1-2). *Paddle*: Uniformly lightly pigmented, midrib slightly darker; external margin smooth; hair 1-P slender. Male genital lobe extending to 0.56 of paddle, female genital lobe to 0.36.

LARVA (fig.24). Head: 0.7 mm. Siphon: 0.9 mm. Anal Saddle: 0.22 mm. Readily separated from other species by the short, broad unequal gills and hair 5-C usually double. *Head*: Width about 1.12 of length. Mental plate with a strong median tooth and 11 distinct teeth (11-12) on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(3, 2-4), 5(2, 1-2), 6(9, 8-11), 7(4, 3-4), 8(1), 9(2, 2-3), 10(1), 11(2, 2-5), 12(1, 1-2), 13(1), 14(1), 15(3, 2-3). *Antenna*: Length about 0.46 of head; pigmentation very light; shaft with very few minute scattered spicules. Hair 1-A about 0.5 from base. *Thorax*: Stellate hairs with a few unequal branches; long hairs barbed and with attenuate apices. Prothorax: hair 0(4, 2-8), 1(3, 3-7), 2(1), 3(5, 4-6), 4(1, 1-2), 5(2), 6(1), 7(1, 1-2), 8(3, 2-4), 9(1, 1-2), 10(1), 11(2, 2-4), 12(1), 14(10, 9-12). Mesothorax: hair 1(2, 2-5), 2(1), 3(1), 4(1), 5(1), 6(4, 4-5), 7(1), 8(6, 5-8), 9(7, 5-8), 10(1), 11(2, 2-3), 12(1), 13(11, 7-11), 14(5, 4-5). Metathorax: hair 1(2, 2-4), 2(1), 3(4, 3-5), 4(2, 2-4), 5(5, 4-6), 6(1), 7(6, 5-7), 8(5, 5-9), 9(5, 5-7), 10(1), 11(2, 1-2), 12(1), 13(4, 1-5). *Abdomen*: Long and stellate hairs as on thorax. Segment I: hair 1(3, 2-7), 2(5), 3(1), 4(3, 3-4), 5(4, 3-6), 6(3, 2-3), 7(1, 1-2), 9(1), 10(1), 11(6, 5-8), 13(3, 2-7). Segment II: hair 0(1), 1(2, 2-6), 2(5, 4-6), 3(1), 4(2, 2-4), 5(6, 4-8), 6(3, 2-3), 7(3, 2-4), 8(1, 1-2), 9(5, 4-6), 10(1), 11(1), 12(1), 13(2, 2-4). Segment III: hair 0(1), 1(2, 2-4), 2(5, 5-6), 3(1), 4(2), 5(5, 5-8), 6(1), 7(5, 3-6), 8(1), 9(5, 4-5), 10(1), 11(1), 12(1), 13(4, 2-8), 14(1). Segment IV: hair 0(1), 1(2, 2-4), 2(6, 5-6), 3(1), 4(2), 5(7, 5-9), 6(1), 7(5, 3-6), 8(1), 9(5, 4-5), 10(1), 11(1), 12(1), 13(5, 3-10), 14(1). Segment V: hair 0(1), 1(3, 2-4), 2(5, 5-6), 3(1), 4(2, 1-3), 5(6, 5-9), 6(1), 7(5, 3-5), 8(1, 1-2), 9(5, 4-6), 10(1), 11(1), 12(1), 13(4, 2-9), 14(1). Segment VI: hair 0(1), 1(2, 2-3), 2(4, 4-5), 3(1), 4(1), 5(4, 2-6), 6(1), 7(3, 2-4), 8(3, 1-3), 9(3, 2-4), 10(1), 11(1), 12(1), 13(3, 2-4), 14(1). Segment VII: hair 0(1), 1(2), 2(1), 3(1), 4(1), 5(2, 2-3), 6(4, 2-5), 7(1), 8(7, 6-9), 9(3, 2-4), 10(1), 11(1), 12(1), 13(2), 14(1). *Segment VIII*: Comb scales 16(14-18) in number; individual scale moderately pigmented, elongate, fringed on sides and apex. Hair 0(1), 1(4, 3-5), 2(1), 3(5, 5-6), 4(1), 5(3, 3-5), 14(1). *Siphon*: Index about 4.25 to 5.3; moderately pigmented but with darker basal ring. Pecten extending to about 0.4, 19(16-25) teeth; individual tooth narrow, long, with minute spinules in distal half. Hair 1(2), 2(1), 3-5 not visible, 6(1), 7(1), 8(1), 9(1). *Anal Segment*: Saddle moderately pigmented. Gills as long as or slightly shorter than saddle length, broad, unequal, ventral 0.64 of dorsal. Hair 1(1), 2(5, 4-5), 3(1), 4a(4, 3-4), 4b(4), 4c(4, 3-4), 4d(4), 4e(3), 4f(3, 1-3).

SYSTEMATICS. Contrary to the opinion of Thompson (1956:199), *inaequalis* is a species distinct from *aureostriatus* (now *grabhami*) and *aurites*. The adults of these 3 forms are readily distinguished from one another by the characters mentioned in the diagnoses and keys but I have not been able to find any reliable characters to separate *inaequalis* from Thompson's *stenei* which, however, I consider to be also a distinct species. The larva of *inaequalis* is clearly differentiated from the other members of the group but the pupa is very similar to that of *stenei*. Furthermore, an ecological barrier separates *inaequalis* from the rest of the group as this species is never found breeding in bromeliads to which the other species are confined. *A. inaequalis* is found primarily at low elevations and seldom above 1,500 feet. I have seen specimens of *inaequalis* only from the parishes of Clarendon, Kingston, Manchester, Portland, St. Andrew, St. Catherine, St. Mary and St. Thomas. This species may be more widely distributed and more common than the records indicate because these are based on immature stages only and these breeding sites have not been as widely sampled as those of the other species of the group.

BIONOMICS. *A. inaequalis* has been found breeding primarily in treeholes and cut and broken bamboo but has also been taken occasionally in rockholes and crabholes. There are no records of this species breeding in bromeliads. Since adults cannot be distinguished at present from *stenei*, it is not known if females of *inaequalis* bite humans but it is possible that some females of this species are included in the *stenei-inaequalis* material obtained in the 24-hour biting-landing survey (fig.7).

DISTRIBUTION (fig.3). Endemic to the island of Jamaica where it has been reported from the parishes of Clarendon, Kingston, Manchester, Portland, St. Andrew, St. Catherine, St. Mary and St. Thomas from near sea level to about 1000 ft. Material examined: 574 specimens; 55 ♂, 81 ♀, 99 pupae, 339 larvae; 83 individual rearings (47 pupal, 28 larval, 8 incomplete).

JAMAICA. *Clarendon*: May Pen, 10 Sept 1965, rockholes, J.N. Belkin (JA 352), 6 p♂ (352-100A,102,104,106,107,109), 6 p♀ (352-32,90,91,93,108,111), 1 lP (352-12), 6 ♂, 8 ♀, 1 P, 8 p, 37 L; 6 Sept 1966, rockholes, D.C. Watson (JA 602), 1 p♂ (602-101), 1 p♀ (602-100), 5 ♂, 7 ♀; 1 Sept 1966, rockholes, D.C. Watson, 2 ♂ (JA 603) [UCLA]. *Manchester*: Hope Farm, elev. 900-1000 ft, 23 Oct 1966, treehole, O.G.W. Berlin and D.C. Watson (JA 634), 2 lp♂ (634-10,17), 5 lp♀ (634-11-13,15,19), 2 p♂ (634-102,104), 3 p♀ (634-100-102), 4 lP (634-14,16,18,20), 1 L, 1 l

[UCLA]. *Portland*: Kemney-Sherwood Forest, elev. 750 ft, 13 Aug 1967, bamboo, J.N. Belkin and W.A. Page, 1 lp♂ (713-10), 1 p♂ (713-100), 16 L (JA 713), 2 lp♂ (715-10,11), 2 p♂ (715-100, 102) [UCLA]. *St. Andrew and Kingston*: Constant Springs, 16 Nov 1966, treehole, O.G.W. Berlin and D.C. Watson, 6 L (JA 696) [UCLA]. Ferry Quarry, 13 Sept 1965, crabhole, W.A. Page, 1 ♀ (JA 369) [UCLA]. Hermitage Dam Road, 20 Aug 1964, rockhole, L. Paton (JA 109), 2 lp♂ (109-10,11), 1 p♂ (109-101), 1 p♀ (109-100), 4 ♂, 1 ♀, 1 P, 2 L; 22 Aug 1965, treehole, W.A. Page (JA 280), 1 p♂ (280-102), 1 ♂; 10 Aug 1965, treehole, W.A. Page (JA 288), 2 lp♀ (288-10,15), 1 p♂ (288-102), 1 ♂; 13 Aug 1965, bamboo, W.A. Page, 1 lp♂ (290-14), 3 lp♀ (290-10,11,13), 2 L (JA 292), 25 L (JA 293), 6 L (JA 294), 1 lp♀ (295-23), 2 ♂, 1 ♀, 10 L (JA 296), 1 L (JA 298), 1 ♀ (JA 299), 1 p♀ (300-20), 2 L (JA 300), 17 L (JA 302), 1 lp♀ (304-22), 3 L (JA 307), 24 L (JA 308), 1 ♂, 1 ♀, 1 P (JA 309); 7 Sept 1965, J.N. Belkin, 1 ♀, 2 L (JA 330), 3 L (JA 331); 29 Oct 1965, treehole, W.A. Page, 1 p♂ (390-100A), 2 p♀ (390-101,102), 1 p♀ (397-105); 13 July 1967, treehole, W.A. Page (JA 826), 1 p♀ (826-20) [UCLA]. Mt. Salus, 17 Sept 1967, bamboo, W.A. Page, 123 L (JA 780) [UCLA]. Temple Hall, elev. 500 ft, 20 Aug 1965, bamboo, W.A. Page, 1 p♀ (250-102), 1 ♂, 1 ♀, 1 P, 5 L (JA 250), 1 lp♂ (252-35), 4 lp♀ (252-102,105,107,108), 1 ♂, 1 p, 6 L, 1 l (JA 252); 25 Aug 1965, bamboo, D.C. Watson (JA 251), 1 p♂ (251-107), 1 lP (251-60), 1 ♂, 11 L [UCLA]. Waterworks, 7 Sept 1965, treehole, J.N. Belkin (JA 327), 1 p♀ (327-104), 1 ♀, 1 p, 1 L; 3 Dec 1965, treehole, W.A. Page (JA 408), 1 lP (408-14) [UCLA]. *St. Catherine*: Harkers Hall, elev. 750 ft, 12 July 1967, bamboo, W.A. Page (JA 822), 2 lp♀ (822-12,14), 1 lP (822-10), 1 ♂, 1 p, 5 L [UCLA]. Rio Cobre Dam, elev. 100 ft, 10 Sept 1965, treehole, J.N. Belkin (JA 351), 1 lp♀ (351-30), 1 p♀ (351-105), 1 lP (351-31), 1 L; 17 Sept 1965, ditch, D.C. Watson, 1 ♂ (JA 372), treehole, 1 ♂, 3 ♀, 1 p (JA 373) [UCLA]. Spanish Town, 9 Sept 1965, treehole, D.C. Watson (JA 605), 1 p♂ (605-102) [UCLA]. *St. Mary*: Prospect, 3 Nov 1964, rockhole, W.A. Page, 1 ♂, 1 ♀, 1 p (JA 173) [UCLA]. *St. Thomas*: Folly, elev. 50 ft, rockhole (JA 103), 4 p♀ (103-102,103,105,108), 1 ♀ [UCLA]. *Parish not specified*: Jan 1940, bamboo, 1 ♂, 2 ♀ [USNM].

11. Aedes (Howardina) stenei Thompson

Figs.3,7,8,25,26

1956. *Aedes stenei* Thompson, 1956:196-199. TYPE: Holotype ♂ (45090211) with associated larval skin and male genitalia slide, near Hope Farm, just above Porus, on road to Mandeville, Manchester (as Clarendon), Jamaica, elev. about 1000 ft, Sept 1945, G.A. Thompson [USNM].

Aedes (Howardina) stenei of Stone, Knight and Starcke (1959:174); Belkin, Schick and Heinemann (1965:31); Forattini (1965:471); Porter (1967:38).

FEMALE. Wing: 2.57 mm. Proboscis: 1.66 mm. Forefemur: 1.58 mm. Abdomen: about 2.02 mm. Essentially similar to *inaequalis* from which it cannot be separated (fig.8).

MALE. Wing: 2.38 mm. Proboscis: 2.1 mm. Forefemur: 1.58 mm. Essentially similar to female in coloration.

MALE GENITALIA (fig.25). Diagnostic characters as in the key. Ninth tergite lobe indistinct, with 2,3 strong bristles. Sidepiece length about 2.5 median width. Clasper about 0.6 of sidepiece length, basal 0.33 with small spicules; spiniform about 0.25 of clasper.

PUPA (fig.25). Abdomen: 2.24 mm. Trumpet: 0.38 mm; index about 5.0. Paddle: 0.68 mm. Chaetotaxy as given below, hairs lightly to moderately pigmented. Very similar to *inaequalis* but distinguished by the deeply pigmented abdominal tergite II and by the presence of a distinct narrow median longitudinal dark stripe on tergite III. Readily separated from *aurites* and *grabhami* by the 2-branched hair 9-C and the lightly pigmented area on the metanotum. *Cephalothorax*: Mesonotum moderately pigmented between trumpets, lateral areas slightly darker; metanotum with a lightly pigmented area in the middle of lateral portion. Hair 1(1), 2(2, 2-3), 3(1), 4(5, 4-7), 5(5, 4-9), 6(1, 1-2), 7(4, 3-9), 8(1, 1-2), 9(2, 2-3), 10(10, 7-18), 11(1), 12(5, 3-7). *Abdomen*: Tergite I moderately pigmented except for usual membranous areas; tergite II strongly pigmented; tergite III with distinct narrow, median, dark longitudinal stripe; pigmentation progressively lighter caudad. Segment I: hair 1(12-17 primary branches, subequal in length each with several secondary branches), 2(1, 1-2), 3(1), 4(6, 4-8), 5(4, 3-8), 6(1), 7(3, 1-3). 9(1), 10(1), 11(1). Segment II: hair 0(1), 1(46, 36-72), 2(1), 3(1), 4(5, 3-6), 5(1), 6(1), 7(4, 2-5), 9(1), 10(1, 1-4, present in some). Segment III: hair 0(1), 1(16, 7-23), 2(1), 3(1, 1-2), 4(3, 2-4), 5(1, 1-2), 6(1), 7(3, 2-4), 8(2, 2-4), 9(1), 10(2, 1-2), 11(1), 14(1). Segment IV: hair 0(1), 1(10, 4-19), 2(1), 3(5, 3-6), 4(3, 1-4), 5(1, 1-3), 6(1), 7(2, 2-4), 8(2, 1-3), 9(1), 10(2, 1-2), 11(1), 14(1). Segment V: hair 0(1), 1(2, 1-7), 2(1), 3(2, 1-3), 4(4, 3-6), 5(1, 1-2), 6(1), 7(4, 2-5), 8(2, 1-3), 9(1), 10(1, 1-2), 11(1), 14(1). Segment VI: hair 0(1), 1(2, 1-4), 2(1), 3(2, 1-2), 4(3, 2-5), 5(1, 1-4), 6(1, 1-2), 7(1), 8(2, 2-4), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1, 1-2), 4(2, 1-2), 5(1), 6(3, 2-4), 7(1), 8(4, 3-5), 9(5, 3-6), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(2, 1-2), 9(10, 8-13), 14(1). *Paddle*: Uniformly very lightly pigmented, midrib slightly darker; external margin smooth. Male genital lobe extending to 0.42 of paddle, female genital lobe to 0.38.

LARVA (fig.26). Head: 0.7 mm. Siphon: 0.95 mm. Anal Saddle: 0.27 mm. Readily separated from other members of the group by the strong, 4-7-branched hair 2-VII. *Head*: Width about 1.02 of length. Mental plate with a strong median tooth and 11 distinct teeth (9-11) on each side, often a detached tooth at base. Hair 0(1), 1(1), 3(1), 4(5, 3-5), 5(4, 3-5), 6(14, 11-14), 7(5, 4-7), 8(1), 9(2, 2-3), 10(1), 11(6, 3-8), 12(2, 1-2), 13(1), 14(1), 15(2, 2-3). *Antenna*: Length about 0.45 of head; pigmentation very light; shaft with a few scattered spicules. Hair 1-A about 0.5 from base. *Thorax*: Stellate hairs with a few, unequal, weakly barbed branches; long hairs barbed and with attenuate apices. Prothorax: hair 0(12, 10-14), 1(9, 7-11), 2(1), 3(14, 8-16), 4(1, 1-2), 5(2, 2-3), 6(1), 7(2, 2-3), 8(6, 6-10), 9(1, 1-2), 10(1), 11(3, 3-5), 12(1), 14(10, 8-14). Mesothorax: hair 1(5, 3-9), 2(1), 3(1), 4(1), 5(1), 6(5, 4-5), 7(1), 8(6, 5-7), 9(8, 7-10), 10(1), 11(2, 1-2), 12(1), 13(14, 10-14), 14(4, 4-9). Metathorax: hair 1(2, 2-8), 2(1), 3(3, 3-5), 4(8, 5-9), 5(8, 6-11), 6(1), 7(7, 7-9), 8(6, 4-9), 9(8, 6-8), 10(1), 11(2, 1-3), 12(1), 13(11, 5-13). *Abdomen*: Stellate hairs as on thorax. Segment I: hair 1(5, 5-12), 2(8, 5-9), 3(1), 4(3, 2-4), 5(8, 7-11), 6(3), 7(1), 9(1), 10(1), 11(8, 7-9), 13(10, 3-12). Segment II: hair 0(1), 1(3, 2-9), 2(7, 3-8), 3(1), 4(3, 2-3), 5(9, 7-11), 6(3), 7(2, 2-3), 8(1, 1-2), 9(6, 5-7), 10(1), 11(1), 12(1), 13(8, 5-12). Segment III: hair 0(1), 1(3, 2-5), 2(7, 5-8), 3(1), 4(2), 5(10, 9-11), 6(1, 1-2), 7(6, 4-7), 8(1), 9(6, 5-7), 10(1), 11(1), 12(1), 13(9, 5-13), 14(1). Segment IV: hair 0(1), 1(3, 2-4), 2(7, 6-8), 3(1), 4(2), 5(9, 9-12), 6(1, 1-2), 7(5, 4-6), 8(1), 9(6, 5-6), 10(1), 11(1), 12(1), 13(10, 7-11), 14(1). Segment V: hair 0(1), 1(2, 2-3), 2(6, 5-7), 3(1), 4(3, 2-4), 5(10, 9-11), 6(1, 1-2), 7(5, 4-6), 8(1), 9(6, 5-6), 10(1), 11(1), 12(1), 13(8, 4-11), 14(1). Segment VI: hair 0(1), 1(2, 2-3), 2(6, 5-7), 3(1), 4(1, 1-2), 5(7, 5-10), 6(1), 7(2, 2-3), 8(3, 2-3), 9(5, 4-6), 10(1), 11(1), 12(1), 13(9, 6-11), 14(1). Segment VII: hair 0(1), 1(2, 2-4), 2(5, 4-7), 3(1), 4(1), 5(2, 2-3), 6(2, 2-3), 7(1), 8(5, 3-7), 9(4, 4-6), 10(1), 11(1), 12(1), 13(6, 3-6), 14(1). *Segment VIII*: Comb scales 18(16-19) in number, individual scale moderately pigmented, elongate and fringed on sides and apex. Hair 0(1), 1(4, 4-6), 2(1), 3(6, 5-7), 4(1), 5(4, 3-5), 14(1). *Siphon*: Index about 5.8-6.7; moderately pigmented, with darker basal ring. Pecten extending to about 0.43; 19(19-24) narrow, long teeth. Hair 1(2, 2-3), 2(1), 3-5 not visible, 6(1), 7(1), 8(2, 1-2), 9(1). *Anal Segment*: Saddle moderately pigmented. Gills subequal;

moderate, less than 2.0 of saddle length. Hair 1(1, 1-2), 2(7, 5-8), 3(1), 4a(4, 4-5), 4b(4, 3-4), 4c(4, 3-4), 4d(4), 4e(4, 3-4), 4f(3, 3-4).

SYSTEMATICS. *A. stenei* appears to be most closely related to *inaequalis*. I have not found any reliable characters to separate the adults of these 2 species and their pupae are also very similar but apparently differentiated by the features mentioned in the diagnoses and key. The larva of *stenei* is readily separated from *inaequalis* and the other members of the group. There appears to be a strong ecological barrier between *stenei*, which breeds exclusively in bromeliads, and *inaequalis*, which is primarily a treehole breeder and has never been found in bromeliads. *A. stenei* has been collected most frequently at elevations of about 1,000 feet and less commonly down to 100 feet and as high as 2,500 feet. Its most common associate is *grabhami*; as indicated under the latter there is a suggestion of occasional hybridization between these 2 forms. *A. stenei* is the most common and widespread species of the group and has been reported from all the parishes of Jamaica except Clarendon, Trelawny and Westmoreland.

BIONOMICS. *A. stenei* has been found breeding only in terrestrial and epiphytic bromeliads. Although the females of *stenei* and *inaequalis* cannot be separated with certainty, I believe that the majority of the *stenei-inaequalis* specimens collected in the 24-hour biting-landing study reported in fig.7 were probably *stenei*. These showed a small peak of activity at 1700 hrs.

DISTRIBUTION (fig.3). Endemic to the island of Jamaica where it has been reported from all the parishes except Clarendon, Trelawny and Westmoreland at elevations of 100 to 2500 ft. Material examined: 1486 specimens; 226 ♂, 380 ♀, 492 pupae, 388 larvae; 371 individual rearings (227 pupal, 102 larval, 42 incomplete).

JAMAICA. *Hanover*: Lethe, elev. 500 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson (JA 666), 2 p♀ (666-100,101), 2 p, 2 L [UCLA]. *Manchester*: Hope Farm, 2 Sept 1945, G.A. Thompson, 1 lp♀ (450902-2); 2 Oct 1945, G.A. Thompson, 2 lp♀ (451002-10,13), 1 lp♀ paratype (451002-3), 1 lp♂, paratype (451002-2); 1 Jan 1946, G.A. Thompson, 1 lp♂, paratype (460101-20), 1 lp♀ (460101-18) [USNM]; elev. 900-1000 ft, 18 Aug 1965, W.A. Page, 1 lp♂ (240-62), 2 lp♀ (240-63, 64), 1 lP (240-65), 1 lp♀ (241-62), 7 p♂ (241-101,103,106-108,110,111), 1 p♀ (241-114), 1 lP (241-60), 2 p♂ (242-62,100), 4 p♀ (242-61,103,105,106); 10 Sept 1965, W.A. Page, 1 lp♀ (355-10), 1 p♀ (355-100), 2 ♂, 2 ♀ (JA 355), 2 ♀ (JA 356); 2 Nov 1966, O.G.W. Berlin, 3 lp♂ (661-10, 11,16), 2 p♂ (661-100,104), 3 p♀ (661-101-103), 4 lP (661-12-15), 1 ♀, 2 p, 6 l (JA 661), 3 ♀ (JA 663A); 12 Nov 1966, O.G.W. Berlin, 90 ♀ (JA 684), 3 P, 5 L (JA 685), 3 lp♂ (688-14,17,19), 2 lp♀ (688-10,18), 9 p♂ (688-105,106,112,117-119,124,125,127), 1 p♀ (688-109), 5 ♀, 1 p, 9 l (JA 688) [UCLA]. Porus, elev. 900-1000 ft, 23 Oct 1966, O.G.W. Berlin and D.C. Watson, 1 lp♀ (630-12), 1 lP (630-13), 1 ♂, 1 p, 3 L (JA 630), 2 lp♂ (631-13,14), 4 lp♀ (631-10,11,16,17), 4 p♂ (631-100, 101,104,107), 6 p♀ (631-102,103,110,111,114,115), 5 lP (631-18-22), 2 ♂, 1 ♀, 1 p (JA 631), 1 lp♂ (632-14), 3 p♂ (632-109-111), 1 p♀ (632-113), 1 lP (632-16), 1 ♂, 1 ♀, 2 P, 2 p, 5 L, 3 l; 1 Nov 1966, O.G.W. Berlin, 1 p♀ (655-102), 1 l (JA 655), 3 lp♀ (658-10,11,13), 6 p♂ (658-100-102,106, 109,111), 3 p♀ (658-104,105,108), 1 lP (658-12), 1 ♀, 2 p, 2 l [UCLA]. *Portland*: Kemney-Sherwood Forest, elev. 750 ft, 13 Aug 1967, J.N. Belkin and W.A. Page, 2 p♀ (706-12,103), 1 ♂, 1 ♀ (JA 706), 1 lp♀ (708-10), 1 ♂, 1 ♀, 2 p, 2 l (JA 708), 2 L (JA 710), 2 p (JA 711) [UCLA]. *St. Andrew and Kingston*: Hermitage Dam Road, 1 Sept 1965, W.A. Page (JA 319), 1 p♂ (319-102); 29 Oct 1965, W.A. Page (JA 392), 3 p♂ (392-103,107,112), 2 p♀ (392-108,110); 15 Aug 1967, J.N. Belkin and W.A. Page, 1 lp♀ (723-25), 2 p♀ (723-100,101), 1 lP (723-22), 1 ♀, 2 P (JA 723), 2 lp♂ (725-22,23), 2 lp♀ (725-11,12), 7 p♂ (725-94,101,102A,103A,108,111,112A), 9 p♀ (725-100,103, 105B,106A,107A,110,111A,113,114), 2 lP (725-20,21), 3 ♀, 1 P, 5 p (JA 725); 25 July 1967, W.A. Page, 3 p♂ (854-100,101,103), 1 p♀ (854-104), 1 lp (854-12), 1 P, 1 l (JA 854), 1 P (JA 855) [UCLA]. Kingston, 15 Sept 1906, M. Grabham, 1 ♂ [USNM]. Mavis Bank, M. Grabham, 1 ♂ [USNM]. Mt. Salus Road, 11 Sept 1967, W.A. Page (JA 779), 2 p♂ (779-102,106), 1 p♀ (779-103) [UCLA]. Newcastle, elev. 2500 ft, 29 Oct 1966, O.G.W. Berlin, 3 L (JA 648) [UCLA]. Shooters

Hill, elev. 1800 ft, 3 Dec 1946, G.A. Thompson, 2 ♀ [IJ]. Stony Hill, 16 Sept 1946, G.A. Thompson, 1 ♀ [IJ]. Temple Hall, elev. 500 ft, 27 Oct 1966, O.G.W. Berlin and D.C. Watson, 3 L (JA 646) [UCLA]. *St. Ann*: Moneague, 1943, R.B. Hill, 1 ♀ [USNM]; 9 Sept 1966, D.C. Watson, 1 ♂, 1 ♀ (JA 607); 17 Aug 1967, J.N. Belkin and W.A. Page (JA 733), 2 lp♂ (733-10,15), 9 lp♀ (733-11-14, 16-19,30), 7 p♂ (733-90,94,97,104,107,110,113), 12 p♀ (733-31,41,92,93,99-102,106,111,112), 12 ♂, 19 ♀, 2 P, 18 p, 11 L, 3 l; 6 Aug 1967, W.A. Page (JA 771), 1 p♀ (771-102), 1 L [UCLA]; Faiths Pen Schoolyard, elev. 1750 ft, 30 Aug 1967, W.A. Page (JA 762), 1 lp♂ (762-11), 2 lp♀ (762-12,13), 1 l♀ (762-14), 1 p♂ (762-103), 1 p♀ (762-102), 1 P, 9 L, 1 l [UCLA]; 2.0 mi S of Moneague near Unity, elev. 1750 ft, 26 Aug 1967, W.A. Page (JA 758), 1 lp♀ (758-23), 4 p♀ (758-31,32,108,111), 5 p♀ (758-105-107,112,114), 8 ♂, 6 ♀, 5 p, 15 L [UCLA]; 29.0 mi post on Moneague Road, elev. 1750 ft, 30 Aug 1967, W.A. Page, 1 lp♂ (763-20), 6 lp♀ (763-12,14,21-23,30), 8 p♂ (763-90,94,96-98,100,107,111), 6 p♀ (763-95,99,101-103,105), 2 ♂, 12 ♀, 11 P, 19 p, 18 L, 1 l (JA 763), 1 lp♂ (764-31), 1 lp♀ (764-34), 5 p♂ (764-32,96,112-114), 4 p♀ (764-90,93,107,111), 1 lp (764-33), 6 ♂, 8 ♀, 5 P, 5 p, 1 L, 1 l [UCLA]; Moneague-Claremont Road, 17 Sept 1965, W.A. Page, 1 p♂ (380-106), 1 p (JA 380), 1 lp♀ (381-12), 1 p♂ (381-100) [UCLA]; Moneague-Ocho Rios Road, 10 Sept 1967, W.A. Page (JA 776), 1 p♂ (776-100) [UCLA]. Mt. Diablo, 17 Sept 1965, W.A. Page, 2 lp♂ (375-11,14), 2 p♀ (375-10,100), 2 lp (375-15,22), 8 ♀, 2 l (JA 375), 3 lp♂ (376-10,11,13), 2 lp♀ (376-15,16), 2 p♂ (376-100,102), 3 P (JA 376); 17 Aug 1967, J.N. Belkin and W.A. Page, 1 lp♂ (731-22), 2 lp♀ (731-20,23), 1 p♂ (731-96), 1 p♀ (731-101), 1 ♂, 2 ♀, 2 p, 3 L (JA 731), 2 lp♀ (732-30,31), 4 p♂ (732-95,103,109,110), 2 p♀ (732-32,98), 1 lP (732-33), 2 P, 2 p, 7 L, 1 l (JA 732), 2 lp♀ (734-10,11), 4 p♂ (734-103,104,106,109), 3 p♀ (734-100,107,108), 1 lP (734-12), 2 ♀, 1 p, 22 L (JA 734); 7 Sept 1967, W.A. Page, 1 lp♀ (779-10), 1 p♀ (774-107), 4 L (JA 774) [UCLA]. *St. Catherine*: Bog Walk, elev. 500 ft, 12 July 1967, W.A. Page (JA 820), 1 p♂ (820-11) [UCLA]. *St. Elizabeth*: Maggotty, elev. 500 ft, 15 Sept 1967, W.A. Page (JA 791), 1 L [UCLA]. *St. James*: Five Miles, elev. 100 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson (JA 676), 1 lp♀ (676-12), 4 p♂ (676-102,103,105,124), 8 p♀ (676-100,101,106,108,109,117,122,125), 4 ♂, 2 ♀, 2 L [UCLA]. Montego Bay, elev. 500 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson (JA 669), 1 lp♂ (669-10), 1 lp♀ (669-11), 2 p♂ (669-100,102), 1 p♀ (669-101), 3 L, 1 l [UCLA]; 16 Jan 1940, 2 ♂, 2 ♀; 17 Jan 1940, 2 ♂, 3 ♀ [USNM]. Reading, elev. 200 ft, 6 Nov 1966, O.G.W. Berlin and D.C. Watson, 3 p♂ (670-100-102), 1 p♀ (670-103), 3 P, 3 p, 5 l (JA 670), 2 lp♀ (671-10,14), 1 p♂ (671-100), 4 lP (671-11-13,15), 13 L (JA 671), 1 p♂ (673-101), 1 p♀ (673-100), 1 lP (674-10), 1 p, 4 L (JA 674) [UCLA]. *St. Mary*: Broadgate, elev. 500 ft, 27 Oct 1966, O.G.W. Berlin and D.C. Watson (JA 643), 4 lp♂ (643-32,38-40), 3 lp♀ (643-34-36), 6 p♂ (643-104,106-108,112,113), 6 p♀ (643-30,100-103,105), 2 lP (643-41,42), 3 ♂, 2 ♀, 2 P, 3 L, 5 l [UCLA]. *St. Thomas*: Port Morant Bay, 16 Aug 1967, J.N. Belkin and W.A. Page (JA 729), 3 lp♂ (729-10,11,20), 1 p♂ (729-102), 4 p♀ (729-100,101,103,104), 7 L, 2 l [UCLA]. Windsor Forest, elev. 750 ft, 30 Oct 1966, O.G.W. Berlin and D.C. Watson, 1 lp♀ (650-24), 3 p♂ (650-104,106,107), 1 p♀ (650-108), 1 lP (650-20), 3 ♂, 2 ♀, 2 L, 2 l (JA 650), 1 lp♂ (651-37), 2 lp♀ (651-35,39), 4 p♂ (651-110-113), 1 p♀ (651-114), 5 lP (651-31-33,36,38), 1 p, 1 l (JA 651), 2 lp♂ (652-11,13), 2 p♂ (652-106,109), 2 p♀ (652-105, 107), 3 L, 2 l (JA 652) [UCLA]. *Parish not specified*: New Park, June 1929, C.D. Williams, 1 ♀ [BM]. Apr 1906, M. Grabham, 1 ♀; 1944, R.B. Hill, 4 ♂, 1 ♀; Jan 1940, W.H.W. Komp, 2 ♂; R.B. Hill, 1 ♂, 4 ♀ [USNM]; W.A. Page, 2 lp♂ (771-10,12), 3 p♂ (771-100,104,107), 3 p♀ (771-13,102, 105), 1 P, 1 p, 28 L (JA 771), 2 lp♀ (772-32,35), 2 p♂ (772-100,112), 2 p♀ (772-102,105), 2 ♂, 5 ♀, 2 P, 3 p, 15 L (JA 772) [UCLA].

Ioliota Group

FEMALES. *Head*: Narrow decumbent scales white. Palpus with apical silvery white scales. *Thorax*: Inner dorsocentral line narrow, pale golden; median prescutellar line broad, white; outer dorsocentral line narrow, pale golden; lateral marginal line narrow, white, nearly continuous from anterior promontory to wingbase. Acrostichal bristles not developed on disc. Scutellum predominantly dark scaled, light scales restricted to median lobe. *Ssp* with distinct silvery patch; upper *stp* patch separate, small. *Legs*: Foretarsus with a few white scales on base of segment 2; midtarsus with small incomplete basal white rings on segments 1,2; hindtarsus with broader complete basal white rings on segments 1-3 and with segment 5 completely or largely white. *Abdomen*: Basomedian tergal white markings dingy white or creamy on segments III-VI or V-VI, white on VII.

MALES. Palpus with submedian white scales on segments 4,5. Larger claw of foreleg and midleg with small acute basal tooth and large blunt submedian tooth; smaller claw with basal tooth only.

MALE GENITALIA. Claspette with short broad conical tubercle bearing 1 or rarely 2 apical bristles. Clasper less than 0.5 of sidepiece; with distinct subapical hairs. Aedeagus subquadrate, shorter than proctiger.

PUPAE. *Cephalothorax*: Hair 5-C single or double, at least 2.0 of hair 4-C; hair 7-C usually single; hair 10-C single to triple. *Abdomen*: All large hairs except 1-II,III, 9-VII,VIII usually single or double; hair 2-II laterad of or in line with hair 3; hair 5-IV,V short to moderate, not exceeding middle of tergite following; hair 9-II-VI caudad of hair 6; 9-VII longer, stouter and with more branches than hair 6-VII. *Paddle*: Moderate; apex rounded; marginal spicules indistinct.

LARVAE. *Head*: Hair 1-C unbranched; 4-C moderately long, multiple; 5,6-C both long, single; hairs 11,14-C weakly stellate, 11-C with unequal branches; 15-C double, long, exceeding apex of mental plate. *Antenna*: Shaft with a few minute sharp spicules; hair 1-A single. *Thorax*: Hair 13-P present. Hairs 0,8,13,14-P, 1,4,5,8,13-T weakly stellate; hair 1-T far mesad of hairs 2,3. *Abdomen*: Integument glabrous dorsally, ventral surfaces of segments II-VIII with rows of minute spinelike spicules; hair 2 distinctly removed cephalad but not beyond hair 8, hair 9 not markedly displaced cephalad. Hairs 2,5-I-VI, 9-II-VI, 11-I distinctly stellate, with a few branches, 2,9,11 distinctly heavier than others, hairs 1-I,II, 7-III-VI, 9-I very weakly stellate; hair 8-VII distinctly cephalodorsad of 9-VII. *Segment VIII*: Comb scales in a single row; individual scales moderate in length, blunt apically and finely fringed. *Siphon*: Index less than 3.0; integument without spicules; distinct attached acus present. Pecten extending to about middle of siphon, not reaching hair 1-S; teeth numerous, closely set, with basal denticles. *Anal Segment*: Saddle body without distinct spicules; caudal margin with short pointed spines preceded by a few rows of spicules; hair 1-X usually single (1-3), near lower end of caudal margin. Ventral brush with 6 pairs of hairs on a small sclerotized boss with distinct grid bars.

DISCUSSION. The Ioliota Group of 2 very similar species is most strikingly differentiated from the other groups of the section by the presence of hair 13-P in the larva, a character not found anywhere else in the section. In adult ornamentation this group is very similar to the Albonotatus Group, differing from it primarily in the presence of light scaling on hindtarsal segment 5.

The 2 species have widely disjunct distributions, *cozumelensis* occurring only on the Yucatan Peninsula and the adjacent Cozumel island and British Honduras, and *ioliota* at the opposite end of the Caribbean sea in northern Venezuela and Trinidad (fig.3). The 2 species are so similar that they obviously belong to the same phylad. Their pattern of distribution is interpreted here as a relict of a former wide distribution of the group in the central Caribbean area. A similar pattern is found in the Walkeri Group.

A larva in a recent collection from a cut bamboo from the province of Guayas (ECU 161) indicates the presence of another member of the Ioliota Group in Ecuador. It differs from other members of the group by a 14-16 branched stellate hair

13-P which is only 3-5 branched in *ioliota* and double in *cozumelensis*. The *albonotatus* of Levi-Castillo (1952a:77; 1952b:555; 1953:40) is probably this member of the Ioliota Group.

Both members of the group were probably originally treehole breeders. They have been reported primarily from artificial containers and *ioliota* has been found breeding in fallen cacao pods. There are no records of this group from bromeliad axils.

12. Aedes (Howardina) ioliota Dyar and Knab

Figs.3,8,27,28

1913.*Aedes ioliota* Dyar and Knab, 1913:76-78. TYPE: Holotype ♀, Trinidad, locality not specified, F.W. Urich [USNM, 16000].

Aedes (Howardina) ioliota of Bonne and Bonne-Wepster (1925:371-372); Dyar (1928:233); Edwards (1932:155); Lane (1939:100; 1953:719-720); Anduze (1941:14); Horsfall (1955:471); Stone and Knight (1956:219-220); Stone, Knight and Starcke (1959:174); Aitken (1960:4); Suarez and Cova Garcia (1961:17-24); Stone (1963:127); Belkin, Schick and Heinemann (1965: 69); Forattini (1965:401); Cova Garcia, Sutil and Rausseo (1966a:57,283; 1966b:73-74,141, 169,334).
Aedes ioliota of Urich (1913:528); Dyar (1918:73).

FEMALE. Wing: 3.33 mm. Proboscis: 2.62 mm. Forefemur: 2.45 mm. Abdomen: about 2.98 mm. As described for the group, with following apparently diagnostic features. *Head*: Median stripe on vertex narrow, white; light scales on sides and venter straw yellow. Erect scales dark brown. Palpus about 0.16 of proboscis. *Thorax* (fig. 3): Scales on anterior promontory white. Inner dorsocentral line narrow, creamy, reaching prescutellar space, followed by a moderate, white-scaled median prescutellar line; outer dorsocentral line narrow, golden; lateral marginal line white, narrow, long, extending from side of anterior promontory to wingbase, apparently interrupted only at scutal angle. Antealar area above paratergite with scattered dark scales. Light scales on median scutellar lobe narrow, white; lateral lobes with a few narrow dark scales. Pleural scales as in the section and group. *Legs*: Forefemur and midfemur predominantly dark anteriorly, a few basal scales creamy, proximal 0.5 of posterior surface straw yellow, extending distally as a narrow line, rest dark; hindfemur predominantly straw yellow to 0.5 on both sides, rest dark scaled. Hindtarsal segment 5 completely white scaled. *Haltere*: Stem pale, knob mostly whitish, a few dark scales dorsally. *Abdomen*: Sternites predominantly creamy on II,III; rest with basal creamy and apical dark scales, latter increasing in extent on distal segments.

MALE. Wing: 2.79 mm. Proboscis: 2.54 mm. Forefemur: 1.93 mm. Essentially similar to female in coloration.

MALE GENITALIA (fig.27). As figured; diagnostic characters as in the key. Ninth tergite lobe prominent, with 5,6 strong bristles. Sidepiece length about 2.5 median width; basolateral scales white, remainder dark. Claspette with 2,3 small subapical hairs. Clasper about 0.5 of sidepiece, with 1 subapical hair; minute spicules on basal 0.5. Dorsal sclerotization of aedeagus very shallowly emarginate, but without distinct lateral lobes.

PUPA (fig.27). Abdomen: 3.35 mm. Trumpet: 0.43 mm; index 4.4-4.6. Paddle: 0.74 mm. Chaetotaxy as given below, hairs moderately to darkly pigmented. Diagnostic characters as in the key. Apparently distinguished from *cozumelensis* by the more dendritic hair 1-II and longer, ovoid or slightly produced paddle, with length about 1.5 greatest width. *Cephalothorax*: Mesonotum moderately pigmented between trumpets, lateral areas and metanotum deeply pigmented; trumpets strongly contrasting. Hair 1(1), 2(2, 1-2), 3(1), 4(2, 1-3), 5(1, 1-2), 6(1), 7(1), 8(3, 2-4), 9(1), 10(2, 1-3), 11(1, 1-2), 12(1, 1-3). *Abdomen*: Tergite I moderately pigmented except for usual membranous areas; segments II and III imbricate, moderately pigmented; rest of segments progressively lighter caudad. Segment I: hair 1(6-12 primary branches, each with many secondary ones), 2(1), 3(1), 4(3, 2-4), 5(2, 2-3), 6(1), 7(1), 9(1). Segment II: hair 0(1), 1(3, strongly dendritic), 2(1, 1-2), 3(1, 1-2), 4(4, 2-5), 5(1), 6(1), 7(1), 9(1). Segment III: hair 0(1), 1(2, 1-4), 2(1), 3(1), 4(2, 1-4), 5(1), 6(1), 7(2, 1-4), 8(2, 1-3), 9(1), 10(1, 1-2), 11(1), 14(1). Segment IV: hair 0(1), 1(1, 1-3), 2(1), 3(3, 1-4), 4(1, 1-2), 5(1), 6(1), 7(2, 1-3), 8(2, 1-2), 9(1), 10(2, 1-3), 11(1), 14(1). Segment V: hair 0(1), 1(1, 1-3), 2(1), 3(1, 1-2), 4(4, 2-5), 5(1), 6(1), 7(3, 1-4), 8(2, 1-3), 9(1), 10(1), 11(1), 14(1, 1-2). Segment VI: hair 0(1), 1(1, 1-2), 2(1), 3(1, 1-2), 4(2, 1-3), 5(1), 6(1), 7(1), 8(2, 1-3), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(2, 1-4), 7(1, 1-2), 8(2, 1-2), 9(3, 2-4), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(5, 4-6), 14(1, 1-2). *Paddle*: Uniformly lightly pigmented, midrib slightly darker; moderately elongate and oval, sometimes slightly produced; external margin smooth; hair 1-P slender. Male genital lobe extending to 0.47 of paddle, female genital lobe to 0.38.

LARVA (fig.28). Head: 0.88 mm. Siphon: 0.86 mm. Anal Saddle: 0.34 mm. Chaetotaxy as given below, hairs moderately to darkly pigmented; in life, larvae are dark. Diagnostic characters as in the key; readily separated from *cozumelensis* by the apically rounded comb scales and hair 1-X single. *Head*: Width about 1.1 of length; integument strongly pigmented. Mental plate with strong median tooth and 10(9-11) distinct teeth on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(13, 12-16), 5(1), 6(1), 7(2, 2-3), 8(1, 1-2), 9(1, 1-2), 10(1), 11(6, 4-7), 12(2, 2-3), 13(1, 1-2), 14(3, 3-7), 15(2, 2-3). *Antenna*: Length about 0.33 of head; uniformly strongly pigmented. Hair 1-A about 0.54 from base. *Thorax*: Long hairs with attenuate apices; long and stellate hairs weakly barbed. Prothorax: hair 0(7, 5-9), 1(3, 2-3), 2(1), 3(4, 3-5), 4(3, 3-5), 5(2, 2-3), 6(1), 7(3, 2-3), 8(6, 5-7), 9(1), 10(1), 11(1, 1-2), 12(1), 13(4, 3-5), 14(20, 18-24). Mesothorax: hair 1(5, 4-6), 2(1), 3(1), 4(1), 5(1), 6(4, 4-5), 7(1), 8(5, 4-6), 9(6, 4-7), 10(1), 11(2, 1-2), 12(1), 13(6, 5-9), 14(5, 3-5). Metathorax: hair 1(4, 4-6), 2(1), 3(2, 1-3), 4(6, 3-6), 5(7, 6-8), 6(1), 7(6, 5-7), 8(5, 4-7), 9(5, 3-6), 10(1), 11(1, 1-2), 12(1), 13(6, 5-7). *Abdomen*: Long and stellate hairs as on thorax. Segment I: 1(4, 4-6), 2(6, 5-7), 3(1), 4(3, 1-4), 5(7, 5-10), 6(3, 2-5), 7(1), 9(4, 3-5), 10(1), 11(6, 6-8), 13(3, 3-5). Segment II: hair 0(1), 1(4, 3-6), 2(6, 6-7), 3(1), 4(2, 2-4), 5(7, 6-9), 6(3), 7(4, 3-4), 8(1, 1-2), 9(6, 4-7), 10(1), 11(1), 12(1), 13(5, 3-5). Segment III: hair 0(1), 1(3, 3-5), 2(7, 6-8), 3(1), 4(1), 5(7, 5-10), 6(2), 7(4, 3-5), 8(1), 9(7, 5-7), 10(1), 11(1), 12(1), 13(3, 3-6), 14(1). Segment IV: hair 0(1), 1(4, 1-4), 2(6, 6-7), 3(1), 4(1), 5(8, 6-9), 6(2), 7(4, 3-5), 8(1), 9(6, 5-8), 10(1), 11(1), 12(1), 13(4, 3-4), 14(1). Segment V: hair 0(1), 1(2, 1-4), 2(6, 6-7), 3(1), 4(1, 1-2), 5(7, 6-8), 6(2), 7(4, 3-5), 8(1, 1-2), 9(4, 4-7), 10(1), 11(1), 12(1), 13(3, 2-4), 14(1). Segment VI: hair 0(1), 1(4, 2-5), 2(6, 5-7), 3(1), 4(1), 5(6, 5-8). 6(2, 1-2), 7(3, 2-3), 8(2, 1-2), 9(5, 4-6), 10(1), 11(1), 12(1), 13(3, 3-4), 14(1, 1-2), Segment VII: hair 0(1), 1(2, 2-4), 2(6, 5-7), 3(1), 4(1), 5(6, 5-7), 6(2, 2-4), 7(1), 8(4, 3-5), 9(3, 2-4), 10(1), 11(1), 12(1), 13(2, 1-3), 14(1, 1-3). *Segment VIII*: Comb scales in a single row, 16(14-19) in number; individual scale moderate, blunt apically and finely fringed. Hair 0(1), 1(6, 5-7), 2(1), 3(7, 5-8), 4(1), 5(4, 3-5), 14(1, 1-2). *Siphon*: Index about 2.3-2.7; darkly pigmented, imbricate. Pecten extending to 0.46;

teeth 14(12-17); smaller basally, progressively larger distad; individual tooth with a long spine and a basal denticle. Hair 1(3, 2-3), 2(1), 3-5 not visible, 6(1), 7(1), 8(1), 9(1). *Anal Segment*: Saddle darkly pigmented, imbricate. Gills short, broad, unequal, ventral 0.67 of dorsal. Hair 1(1, 1-3), 2(5, 4-6), 3(1), 4a(4, 4-6), 4b(4, 3-4), 4c(4, 3-4), 4d(4, 3-5), 4e(3, 3-4), 4f(3, 1-3).

SYSTEMATICS. *A. ioliota* is extremely similar to *cozumelensis* from which it is differentiated apparently only by the few constant diagnostic characters mentioned above. There is no indication of any differentiation between the populations from Trinidad and Venezuela. This species is apparently restricted to low and moderate elevations in the Cordillera de la Costa in Venezuela and in Trinidad but may be present in the intermediate area.

BIONOMICS. The reported breeding sites of *ioliota* are quite varied, ranging from rockholes, treeholes, broken and cut bamboo to fallen cacao fruits and artificial containers of varied size. Females have been taken in biting-landing collections (TR 1132). Attempts at experimental infection with yellow fever virus have yielded negative results (Aitken 1960:4).

DISTRIBUTION (fig.3). Trinidad and Venezuela (northern) at low to moderate elevations. Material examined: 115 specimens; 15 ♂, 23 ♀, 30 pupae, 47 larvae; 30 individual rearings (12 pupal, 15 larval, 3 incomplete).

TRINIDAD. *St. Andrew*: Cumaca, elev. 250 ft, 22 Oct 1964, rockhole, A. Guerra (TR 783), 1 lp♂ (783-104), 2 lp♀ (783-103,105); elev. 500 ft, 14 Jan 1965, tub, A. Guerra (TR 940), 3 lp♂ (940-120,121,129), 3 lp♀ (940-110,113,125), 1 p♀ (940-111), 3 lP (940-114,122,123), 12 L; 18 Feb 1965, tin can, A. Guerra, 1 lp♀ (1008-21), 1 p♂ (1008-20), bamboo pot, 2 p♂ (1013-10,11), 1 p♀ (1013-13), 5 L (TR 1013) [UCLA]; Cumaca Road, elev. 500 ft, 14 Jan 1965, fallen cacao pod, A. Guerra (TR 938), 4 lp♀ (938-128-131), 8 L [UCLA]. *St. George*: Mt. Beck, elev. 1000 ft, 29 Apr 1965, biting collection, A. Guerra, 1 ♀ (TR 1132) [UCLA] *County not specified*: F.W. Urich, 3 ♀, type series [USNM no. 16000].

VENEZUELA. *Aragua*: Choroni, Mar 1939, P.J. Anduze, 1 ♂ [USNM]. Guamito, 19 June 1927, M.N. Tovar, 1 ♀; 4 July 1927, M.N. Tovar, 1 ♀ [USNM]; 1 Dec 1967, cut bamboo, R. Hansell and J.J. Vera (VZ 83), 1 lp♂ (83-13), 3 p♂ (83-101,105,106), 1 p♀ (83-102), 4 L [UCLA]. Maracay, 4 July 1927, M.N. Tovar, 1 p♂ [USNM]. Ocumare de la Costa, 12 Aug 1927, M.N. Tovar, 1 ♀ [USNM]. Colonia Tovar, Capital, Guamitas, Rancho Grande and Uraca (Cova Garcia, Sutil and Rausseo 1966b:73). *Carabobo*: Las Trincheras (Cova Garcia, Sutil and Rausseo 1966b:73). *Falcon*: Cumarebo (Cova Garcia, Sutil and Rausseo 1966b:73). *Miranda*: Carenero and Charallave (Cova Garcia, Sutil and Rausseo 1966b:74). Hacienda Los Chaguaramos (Suarez and Cova Garcia 1961: 17; Cova Garcia, Sutil and Rausseo 1966b:74). Los Teques and Petare (Cova Garcia, Sutil and Rausseo 1966b:74). *Trujillo*: Sabana de Mendoza (Cova Garcia, Sutil and Rausseo 1966b:74).

13. Aedes (Howardina) cozumelensis Diaz Najera

Figs.3,8,29,30

1966. *Aedes (Howardina) cozumelensis* Diaz Najera, 1966a:331-344. TYPE: Holotype ♂ with genitalia slide, San Miguel de Cozumel, Territorio de Quintana Roo, Mexico, 25 Sept 1965, A. Diaz Najera [ISET, 6529].

Aedes (Howardina) cozumelensis of Stone (1967:208).

FEMALE. Wing: 3.5 mm. Proboscis: 2.98 mm. Forefemur: 2.28 mm. Abdomen: about 2.5 mm. Very similar to *ioliota* in color and size, differing apparently only in the following (fig.8). Hindtarsal segment 5 with some apical and posterior dark scales, rest white.

MALE. Wing: 3.15 mm. Proboscis: 2.45 mm. Forefemur: 2.01 mm. Essentially similar to female in coloration.

MALE GENITALIA (fig.29). As figured; diagnostic characters as in the key. Ninth tergite lobe indistinct, with 4,5 strong setae. Sidepiece length about 3.0 median width. Claspette with 1 apical seta and varied number of smaller subapical setae, progressively smaller basally. Clasper about 0.5 of sidepiece, with 1,2 subapical hairs; basal 0.5 with spicules.

PUPA (fig.29). Abdomen: 3.78 mm. Trumpet: 0.55 mm; index about 4.1. Paddle: 0.74 mm. Description based on a single skin. Diagnostic characters as in the key. Apparently differing from *ioliota* by hair 1-II with a few simple branches and paddle shorter, length about 1.2 greatest width. *Cephalothorax*: Mesonotum moderately pigmented between trumpets, lateral areas and metanotum strongly pigmented; trumpets strongly contrasting. Hair 5-C strong, at least 2.0 as long as 4-C. *Abdomen*: Tergite I strongly pigmented except for usual membranous areas; segments II-IV strongly pigmented; rest of segments progressively lighter caudad. All large hairs except 1-II, 9-VII,VIII usually single or double; hair 1-II not distinctly dendritic and with about 8 branches. *Paddle*: Uniformly moderately pigmented, midrib slightly darker; slightly broadened in distal half; external margin with submarginal serrations. Male genital lobe extending to about 0.5 of paddle, female genital lobe to 0.36.

LARVA (fig.30). Head: 0.76 mm. Siphon: 0.65 mm. Anal Saddle: 0.27 mm. Description based on a single specimen. Diagnostic characters as in the key. Hairs moderately to strongly pigmented. Readily separated from *ioliota* by the apically pointed comb scales and hair 1-X double. *Head*: Hairs and branching as in *ioliota*. Mental plate with a strong median tooth and 10 distinct teeth on either side, a smaller detached tooth at base. *Antenna*: Slender, moderate; strongly pigmented. Hair 1-A at about 0.56 from base. *Thorax*: Hair 13-P double. *Segment VIII*: Comb scales in a single row, 14 in number; individual scale moderate, pointed apically and fringed. *Siphon*: Index about 2.0; imbricate, moderately pigmented, with darker basal ring. Pecten extending to 0.6; teeth 15,16; individual tooth with long spine and a small basal denticle. *Anal Segment*: Saddle imbricate, moderately pigmented and with darker basal ring. Gills short, broad, unequal, ventral about 0.64 of dorsal.

SYSTEMATICS. *A. cozumelensis* is obviously very closely related to *ioliota* from which it is separated in all stages apparently only by the few constant features mentioned in the diagnosis. This species is known from the Yucatan Peninsula and the adjacent Cozumel Island and British Honduras.

BIONOMICS. The immature stages of *cozumelensis* have been found only in artificial containers but it is very likely that the natural breeding sites of this species are similar to those of the closely related *ioliota*. Adults of *cozumelensis* have been collected at dusk on human bait in British Honduras.

DISTRIBUTION (fig.3). Yucatan Peninsula and adjacent islands in Mexico (states of Quintana Roo and Yucatan) and British Honduras. Material examined: 11 specimens; 1 ♂, 8 ♀, 1 pupa, 1 larva; no individual rearings.

BRITISH HONDURAS. *Cayo*: Georgeville, elev. 300 ft, 27 July 1967, D.S. Bertram, biting collections, 1 ♀ (BH A369); 1 Aug 1967, D.S. Bertram, 3 ♀ (BH A339) [UCLA]. Roaring Creek, elev. 70 ft, 27 July 1967, biting collections, D.S. Bertram, 1 † (BH A339); 3 Aug 1967, D.S. Bertram, 1 ♀ (BH 376); 9 Aug 1967, D.S. Bertram, 1 ♀ (BH 427) [UCLA].

MEXICO. *Quintana Roo*: Cozumel Island, 25 Sept 1965, A. Diaz Najera, holotype ♂ (6529), 1 paratype ♀, 1 p. *Yucatan*: Tizimin, 8 Dec 1960, M. Munoz, 1 L [ISET].

Albonotatus Group

FEMALES. *Head*: Narrow decumbent scales white. Palpus with a few apical silvery white scales. *Thorax*: Inner dorsocentral line narrow, creamy; median prescutellar line broad, white; outer dorsocentral line narrow, pale golden; lateral marginal line narrow, silvery white, extending from side of anterior promontory to wingbase. Acrostichal bristles not developed on disc. Scutellum predominantly dark scaled, light scales restricted to median lobe. *Ssp* with distinct silvery patch; upper *stp* patch separate, small. *Legs*: Foretarsus with a few basal white scales on segment 2; midtarsus with small incomplete basal white rings on segments 1,2; hindtarsus with broader complete basal white rings on segments 1-3. *Abdomen*: Basomedian tergal light markings creamy on segments II-VII or III-VII.

MALES. Palpus with basomedian white scales on segments 4,5. Larger claw of foreleg and midleg with small acute basal tooth and large blunt submedian tooth; smaller claw simple.

MALE GENITALIA. Claspette represented by a basomesal tubercle bearing 1 apical bristle. Clasper subequal to or definitely shorter than sidepiece; subapical hairs not developed. Aedeagus ovate, subequal to proctiger.

PUPAE. *Cephalothorax*: Hair 5-C double to 4-branched, subequal to hair 4-C and distinctly shorter than distance from its base to that of trumpet; hair 7-C simple to triple; hair 10-C single to 5-branched. *Abdomen*: All large hairs except 1-II,III, 9-VII, VIII usually single or double; hair 2-II laterad of or in line with hair 3; hair 5-IV,V short, not exceeding apex of tergite following; hair 9-II-VI varied in position; 9-VII longer, stouter and with more branches than 6-VII. *Paddle*: Very long or moderate; apex rounded or slightly emarginate; marginal spicules distinct.

LARVAE. *Head*: Hair 1-C unbranched; 4-C moderately long, multiple; 5-C single, long; 6-C usually double, strong; none of the ventral hairs stellate; 14-C with a few spikelike branches; 15-C double, long, exceeding apex of mental plate. *Antenna*: Shaft without distinct spicules; hair 1-A very thin, single. *Thorax*: Hair 13-P absent. Only hairs 8,13-P distinctly stellate; hair 1-T far mesad of hairs 2,3. *Abdomen*: Integument glabrous; hair 2 distinctly displaced cephalad but not beyond hair 8, hair 9 not markedly displaced cephalad. Only hairs 2,9-I-VI, 11-I distinctly stellate, with a few spikelike branches; hair 8-VII distinctly cephalad of 9-VII. *Segment VIII*: Comb scales in a single or partial double row; individual scales rather short, blunt and faintly fringed. *Siphon*: Index less than 2.5; integument without spicules; distinct free or attached acus present. Pecten not extending beyond middle of siphon; teeth numerous, closely set and with basal denticles. *Anal Segment*: Saddle body without distinct spicules; caudal margin with very short pointed spines preceded by a few spicules; hair 1-X usually double (1-3), near lower end of caudal margin. Ventral brush with 6 pairs of hairs on a moderately or strongly sclerotized boss with distinct grid bars, 1 or 2 hairs usually detached.

DISCUSSION. The 2 very similar species of the Albonotatus Group are strikingly differentiated from each other by male genitalic characters, an unusual occurrence in the subgenus. The group is very similar in adult ornamentation to the Ioliota Group, differing from it primarily in having hindtarsal segment 5 completely dark. The larvae of the Albonotatus Group lack hair 13-P which is present in the Ioliota Group. Since the loss of hair 13-P is a derived feature it appears that the Albonotatus Group was probably derived from the Ioliota Group.

The Albonotatus Group has a distribution complementary to that of the Busckii Group (fig.3). *A. albonotatus* has been reported from Hispaniola (Haiti and Dominican Republic) and doubtfully from Guadeloupe, and *bahamensis* from the Bahamas (Grand Bahama and New Providence). As indicated under *albonotatus*, a third species of the group may be present in the Dominican Republic.

The natural breeding sites of the group are probably treeholes and broken bamboo, as has been reported for *albonotatus*. To date *bahamensis* has been found only in artificial containers.

14. Aedes (Howardina) albonotatus (Coquillett)

Figs.3,8,31

1905.*Gymnometopa albonotata* Coquillett, 1905:183. TYPE: Lectotype ♂ (141.3) with associated larval and pupal skins, San Francisco Mts., Santo Domingo [Dominican Republic], 3 Sept 1905, A. Busck [USNM, 8297; selection of Stone and Knight, 1956:213].

Aedes (Howardina) albonotatus of Dyar (1928:233-234); Edwards (1932:155); Gerry (1932:40); Lane (1939:98; 1953:717-719); Horsfall (1955:471); Stone and Knight (1956:213); Stone, Knight and Starcke (1959:173); Belkin, Schick and Heinemann (1965:18); Forattini (1965: 461); Porter (1967:38).
Aedes (Howardina) albonotata of Bonne and Bonne-Wepster (1925:369-370).
Aedes albonotata of Dyar and Knab (1906b:190,196); Dyar (1906:15); Howard, Dyar and Knab (1912:70; 1917:618,619,834-835); Dyar (1918:73,80); Root (1927:465).
Gymnometopa albonotata of Coquillett (1906b:25); Theobald (1907:211; 1910:219); Surcouf and Gonzalez-Rincones (1911:212,213).
Haemagogus albonotata of Dyar and Knab (1906a:166).

FEMALE. Wing: 2.9 mm. Proboscis: 2.1 mm. Forefemur: 1.91 mm. Abdomen: about 2.98 mm. As described for the group, with following apparently diagnostic features. *Head*: Median stripe on vertex narrow, white; light scales on sides and venter straw yellow. Erect scales predominantly dark, a few median ones whitish. Palpus about 0.14 of proboscis. *Thorax* (fig.8): Scales on anterior promontory white. Inner dorsocentral line narrow, creamy, reaching prescutellar space, followed by a white-scaled median prescutellar line; outer dorsocentral line narrow, golden; lateral marginal line narrow, pure white, extending from sides of anterior promontory to wing-base, apparently interrupted only at scutal angle. Antealar area above paratergite with scattered dark scales. Light scales on median scutellar lobe narrow, white; lateral lobes with a few narrow bronzy scales. Pleural scales as in the section and group. *Legs*: Forefemur and midfemur predominantly dark, a few basal scales creamy, proximal 0.5 of posterior surface mostly straw yellow, extending distally as narrow line, rest dark; hindfemur straw yellow to proximal 0.5 on both sides, rest dark scaled. Hindtarsal segment 3 white scaled in at least basal 0.7. *Haltere*: Stem pale, knob mostly whitish, a few dark scales dorsally. *Abdomen*: Basomedian tergal light scales dingy white on II-VII. Sternites straw yellow to segment IV; rest with basal straw yellow and apical dark scales.

MALE. Wing: 2.28 mm. Proboscis: 1.93 mm. Forefemur: 1.49 mm. Essentially similar to female in coloration.

MALE GENITALIA (fig.31). As figured; diagnostic characters as in the key. Ninth tergite lobe prominent, with 4 strong bristles. Sidepiece length about 3.0 median width; most tergomesal bristles parallel to longitudinal axis. Clasper narrow, long, subequal to sidepiece; spiniform about 0.2 of clasper. Dorsal sclerotization of aedeagus slightly emarginate.

PUPA (fig.31). Abdomen: 2.7 mm. Trumpet: 0.35 mm; index 4.5. Paddle: 0.7 mm. Chaetotaxy as given below. Diagnostic characters as in the key. Readily separated from *bahamensis* by longer paddle, hair 7-C single and 9-VIII only 3-branched. *Cephalothorax*: Mesonotum and metanotum lightly pigmented; trumpets contrasting. Hair 1(1), 2(2), 3(1, 1-2), 4(2, 2-3), 5(2, 2-3), 6(1), 7(1), 8(2), 9(1), 10(1), 11(1), 12(1, 1-2). *Abdomen*: Tergite I lightly pigmented except for usual membranous areas; pigmentation of other segments progressively lighter caudad. Segment I: hair 1(9-13 primary branches, each with many secondary ones), 2(1), 3(1), 4(6, 2-8), 5(2, 1-2), 6(1), 7(1), 9(1). Segment II: 0(1), 1(2, 2-3), 2(1), 3(1), 4(2, 1-3), 5(1, 1-2), 6(1), 7(1, 1-2), 9(1). Segment III: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(2, 2-3), 5(1), 6(1), 7(2, 1-3), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(2, 1-2), 2(1), 3(1, 1-2), 4(2), 5(2), 6(1), 7(2, 1-2), 8(1), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1, 1-2), 5(1), 6(1), 7(2, 1-2), 8(2, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(1), 7(1), 8(2, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(1), 7(1), 8(1), 9(2, 2-3), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(3), 14(1). *Paddle*: Long; uniformly lightly pigmented, midrib slightly darker; external margin serrated; hair 1-P slender. Male genital lobe extending to 0.55 of paddle, female genital lobe to 0.34.

LARVA (Description based on Howard, Dyar and Knab, 1917:853; only fragments of two individual rearings seen). Diagnostic characters as in the key. Readily separated from *bahamensis* by the subequal gills and nature of the comb scales. *Head*: Width slightly greater than length. Mental plate broadly triangular, with a median tooth and 12 distinct teeth on either side. *Antenna*: Slender, moderate, uniform; all hairs single. *Thorax*: Rounded, wider than long. *Abdomen*: Moderate, anterior segments shorter. *Segment VIII*: Comb scales in a single row of about 15; individual scale elongate, rounded at tip and with small spinules. *Siphon*: Short, tapered on outer half, with an index of about 2.0. Pecten extending beyond middle, hair 1-S just within the last tooth; individual tooth with long spine and a small basal denticle. *Anal Segment*: Saddle as long as wide; caudal margin fringed with spines. Gills about 2.0 length of anal segment; broad and saclike, ventral pair subequal to dorsal.

SYSTEMATICS. In spite of the very limited material available and the very close similarity in the ornamentation of the adults, I consider *albonotatus* to be undoubtedly a species distinct from *bahamensis*. The male genitalia of the 2 species are markedly differentiated and the immature stages are also obviously distinct.

A. albonotatus has been reported from Haiti, Dominican Republic, Bahamas and Guadeloupe (Stone, Knight and Starcke 1959:173). I have not seen specimens from Haiti but this record may be correct as the type locality of *albonotatus* is in the Dominican Republic, also on the island of Hispaniola. The record from the Bahamas is based on a single female from New Providence which in my opinion is *bahamensis* (see). The male from Guadeloupe collected by Busck [USNM] is unquestionably *albonotatus* and it is possible that this species does occur on this island. However, no additional specimens of *albonotatus* have been found in extensive surveys on Guadeloupe in recent years and the possibility exists, particularly in view of the extreme similarity of this specimen with males from the type series of *albonotatus* from the Dominican Republic, that an error occurred in labeling Busck's material and that this Guadeloupe specimen was actually part of this type series. In addition to the type series I have seen 2 females from the Dominican Republic, near Sanchez [USNM], which differ from the former in the presence of some pale scales on the remigium of the wing. These females are only tentatively identified as *albonotatus* since they are from the northern part of the complex island of Hispaniola and there is a possibility that another species of the group may occur there.

The record of *albonotatus* from Ecuador (Levi-Castillo 1952a:77; 1952b:555; 1953:40) is probably based on a misidentification of an undescribed species of the Ioliota Group (see).

BIONOMICS. The type series of *albonotatus* was reared from larvae and pupae collected in bamboo stumps.

DISTRIBUTION (fig.3). Island of Hispaniola (Haiti and Dominican Republic) and doubtfully Guadeloupe. Material examined: 17 specimens; 5 ♂, 6 ♀, 4 pupae, 2 larvae; 4 individual rearings (2 pupal, 2 larval).

DOMINICAN REPUBLIC. Sanchez, 5 Apr 1949, J.M. Brennan, 2 ♀ [USNM]. San Francisco Mts, Sept 1905, bamboo, A. Busck, 1 lp♂ (141-2), 1 lp♀ (136-2), 1 p♂ (136-3), 1 p♀ (141-7), 1 ♂ (141), 1 ♂, 1 ♀ (136), 1 ♀ [USNM, UCLA].

?GUADELOUPE. July 1905, A. Busck, 1 ♂ [USNM].

HAITI. Mt. Cabrite, 12 Oct 1924, W.A. Hoffman (Root 1927:465).

15. Aedes (Howardina) bahamensis Berlin, n.sp.

Figs.3,8,32,33

TYPES: Holotype ♂ (BAH 1) with genitalia slide, village of Hunter, Grand Bahama, Bahama Islands, 28 Nov 1964, A. Spielman and A.E. Weyer, from colony established from larvae collected in artificial containers [USNM]. Allotype ♀ (BAH 1), same data as holotype. Paratypes: 10 ♂, 5 ♀, 9 pupae and 12 larvae (BAH 1), same data as holotype [UCLA].

Aedes (Howardina) albonotatus of Spielman and Weyer (1965:339-343); in part of Stone, Knight and Starcke (1959:173).

FEMALE. Wing: 3.5 mm. Proboscis: 2.62 mm. Forefemur: 2.36 mm. Abdomen: about 3.25 mm. Essentially similar to *albonotatus* but differing by a slightly larger size and in the following (fig.8). Palpus about 0.16 of proboscis. Hindtarsal segment 3 white scaled in barely more than basal 0.5. Basomedian tergal light scales on abdomen creamy on II-VII. Sternites completely straw yellow up to V, rest with basal straw yellow and apical dark scales.

MALE. Wing: 3.06 mm. Proboscis: 2.45 mm. Forefemur: 2.28 mm. Essentially similar to female in coloration.

MALE GENITALIA (fig.32). As figured; diagnostic characters as in the key. Ninth tergite lobe prominent, with 4 strong setae. Sidepiece length about 3.0 median width; basolateral scales white, remainder dark; tergomesal surface clothed with numerous strong, long setae; distal sternomesal margin with threadlike setae with twisted apices. Clasper broad at base, curved mesad on distal 0.7. Dorsal sclerotization of aedeagus deeply emarginate, producing distinct apical lobes.

PUPA (fig.32). Abdomen: 4.05 mm. Trumpet: 0.54 mm; index about 4.0. Paddle: 0.78 mm. Diagnostic characters as in the key. Chaetotaxy as given below, hairs darkly pigmented. Readily distinguished from *albonotatus* by the shorter paddle, 7-C usually double and 9-VIII at least 5-branched. *Cephalothorax*: Mesonotum moderately pigmented between trumpets; sides and metanotum deeper; trumpets strongly contrasting. Hair 1(1, 1-2), 2(2, 2-4), 3(1), 4(4, 3-6), 5(2, 2-4), 6(1, 1-2), 7(3, 1-3), 8(3, 2-5), 9(1, 1-2), 10(4, 2-5), 11(1), 12(3, 2-5). *Abdomen*: Tergite I uniformly strongly pigmented except for usual membranous areas; other segments imbricate, strongly pigmented, progressively lighter caudad. Segment I: hair 1(3-10 primary branches, each with many secondary ones), 2(1), 3(1), 4(5, 4-6), 5(5, 3-6), 6(2, 1-3), 7(3, 2-4), 9(1), 10(1, present in many), 11(1, present in a few). Segment II: hair 0(1), 1(6, 4-14), 2(1), 3(1), 4(6, 4-8), 5(1, 1-2), 6(2, 1-3), 7(3, 2-5), 9(1), 10(2, 1-2, present in a few). Segment III: hair 0(1, 1-2), 1(2, 1-4), 2(1), 3(1, 1-2), 4(3, 3-5), 5(1, 1-2), 6(3, 1-4), 7(4, 2-9), 8(3, 2-4), 9(1), 10(2, 2-3), 11(1), 14(1). Segment IV: hair 0(1), 1(1, 1-2), 2(1), 3(3, 2-4), 4(2, 1-3), 5(1, 1-2), 6(2, 1-3), 7(3, 2-4), 8(3, 2-5), 9(1), 10(2, 1-3), 11(1), 12(1, present in one specimen), 14(1). Segment V: hair 0(1, 1-2), 1(2, 1-3), 2(1), 3(1, 1-3), 4(3, 2-5), 5(1, 1-2), 6(2, 1-2), 7(3, 2-4), 8(3, 2-4), 9(1), 10(1, 1-2), 11(1), 14(1). Segment VI: hair 0(1, 1-2), 1(1, 1-3), 2(1), 3(2, 1-2), 4(2, 2-3), 5(1), 6(1), 7(2, 1-3), 8(3, 2-4), 9(1), 10(1, 1-2), 11(1), 14(1, 1-2). Segment VII: hair 0(1, 1-2), 1(1, 1-3), 2(1), 3(2, 1-3), 4(1, 1-2), 5(1), 6(1, 1-2), 7(1), 8(2, 1-3), 9(3, 2-5), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(9, 5-12), 14(1, 1-2). *Paddle*: Uniformly lightly pigmented, midrib slightly darker; dorsal surface with fine denticles; external margin distinctly serrated and faintly emarginate; hair 1-P slender. Male genital lobe extending to 0.65 of paddle, female genital lobe to 0.44.

LARVA (fig.33). Head: 0.92 mm. Siphon: 0.73 mm. Anal Saddle: 0.35 mm. Chaetotaxy as given below, hairs darkly pigmented. Diagnostic characters as given in the key. Readily separated from *albonotatus* by the unequal gills, pecten teeth terminating before middle of siphon and hair 1-S distinctly beyond last pecten tooth. *Head*: Width about 1.06 of length, moderately pigmented, deeper around mouthparts. Mental plate with a strong median tooth and usually 12(11-13) distinct teeth on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(9, 7-10), 5(1), 6(2, 1-2), 7(2, 2-3), 8(1), 9(2, 1-3), 10(1), 11(5, 3-6), 12(2, 2-3), 13(1), 14(2, 2-3), 15(2, 2-3). *Antenna*: Length about 0.34 of head; moderately pigmented and without spicules; hair 1-A at about 0.5 from base. *Thorax*: Apices of long hairs attenuate; stellate hairs with a few branches; long and stellate hairs weakly barbed. Prothorax: hair 0(6, 4-6), 1(3, 3-4), 2(1), 3(4, 3-5), 4(3, 2-5), 5(2, 2-3), 6(1), 7(2, 2-3), 8(7, 5-8), 9(2, 1-2), 10(1), 11(2, 1-3), 12(1), 14(20, 17-29). Mesothorax: hair 1(3, 3-4), 2(1), 3(1), 4(1), 5(1, 1-2), 6(5, 4-5), 7(1), 8(6, 5-9), 9(5, 5-8), 10(1), 11(1, 1-2), 12(1), 13(6, 3-7), 14(3, 3-4). Metathorax: hair 1(4, 3-5), 2(1), 3(3, 3-5), 4(3, 2-4), 5(3, 3-5), 6(1), 7(6, 5-7), 8(6, 3-6), 9(5, 4-6), 10(1), 11(1, 1-2), 12(1), 13(4, 4-7). *Abdomen*: Stellate hairs as on thorax. Segment I: hair 1(6, 4-7), 2(7, 6-8), 3(1), 4(6, 4-8), 5(6, 4-9), 6(4, 3-5), 7(1), 9(4, 3-5), 10(1), 11(5, 4-7), 13(4, 2-4). Segment II: hair 0(1), 1(3, 2-4), 2(8, 6-8), 3(1), 4(6, 4-6), 5(5, 3-6), 6(4, 3-5), 7(2, 1-3), 8(2), 9(4, 3-5), 10(1), 11(1, 1-2), 12(1), 13(4, 3-5). Segment III: hair 0(1), 1(3, 2-3), 2(7, 6-8), 3(1), 4(2, 1-3), 5(4, 3-7), 6(3, 2-3), 7(5, 4-7), 8(1), 9(6, 5-7), 10(1, 1-2), 11(1, 1-2), 12(1, 1-2), 13(3, 2-4), 14(1). Segment IV: hair 0(1), 1(2, 2-3), 2(7, 5-8), 3(1), 4(2, 1-3), 5(5, 4-7), 6(3, 2-4), 7(5, 4-6), 8(1, 1-2), 9(6, 6-9), 10(1, 1-2), 11(1, 1-2), 12(1), 13(2, 2-4), 14(1). Segment V: hair 0(1), 1(3, 2-3), 2(8, 6-9), 3(1), 4(2, 2-3), 5(6, 3-9), 6(2, 2-3), 7(5, 4-5), 8(1, 1-2), 9(7, 6-8), 10(1), 11(2, 1-2), 12(1), 13(2, 2-3), 14(1, 1-2). Segment VI: hair 0(1, 1-2), 1(3, 2-5), 2(6, 6-8), 3(1), 4(1), 5(4, 3-5), 6(2, 1-2), 7(4, 3-6), 8(2, 2-3), 9(5, 5-7), 10(1), 11(2, 1-3), 12(1), 13(4, 2-5), 14(2, 2-3). Segment VII: hair 0(1), 1(4, 3-6), 2(7, 6-8), 3(1), 4(1), 5(4, 3-4), 6(3, 2-4), 7(1, 1-2), 8(4, 4-5), 9(3, 3-4), 10(1, 1-2), 11(1, 1-2), 12(1), 13(3, 1-4), 14(3, 2-3). *Segment VIII*: Comb scales in a single row, in the form of a wide chevron, 10-18 in number; individual scale moderate; apex blunt and finely fringed. Hair 0(1), 1(4, 2-5), 2(1), 3(7, 6-8), 4(1), 5(4, 2-4), 14(2, 2-3). *Siphon*: Index about 2.18-2.4; integument imbricate, moderately pigmented, with darker basal ring. Pecten extending to 0.4, usually 10(6-14) teeth, smaller at base, progressively larger distad; individual tooth with long spine and a basal denticle; hair 1-S distinctly distad of last tooth; acus distinct, free or attached. Hair 1(3, 2-4), 2(1), 3-5 not visible, 6(1), 7(1), 8(2, 2-3), 9(1). *Anal Segment*: Saddle moderately pigmented and imbricate; caudal margin with short spines. Gills short to moderately long, unequal, ventral about 0.5-0.6 of dorsal. Hair 1(2, 1-3), 2(1), 3(4, 4-6), 4a(4, 3-5), 4b(3), 4c(3, 2-4), 4d(3, 3-4), 4e(3, 3-4), 4f(3, 2-4).

EGG. Length about 0.67 mm. Width about 0.14 mm; exochorion transparent, with characteristic circular clear refractive bodies; endochorion dark and with large irregular polygonal sculpturing.

SYSTEMATICS. I have no hesitation in recognizing *bahamensis* as a species distinct from the superficially similar *albonotatus* since the male genitalia are completely different in the 2 forms and the immature stages also appear to be differentiated by constant features mentioned in the diagnosis. In addition to the type series derived from a laboratory colony established from material collected on Grand Bahama Island and described as *albonotatus* by Spielman and Weyer (1965:339-343), I have included under *bahamensis* a single female reared from a treehole on New Providence Island, on which previous records of *albonotatus* from Bahamas were based. Although this specimen agrees well with the type material, the presence of *bahamensis* on New Providence can be confirmed only by additional material, especially males and immature stages.

BIONOMICS. Spielman and Weyer (1965) recorded *bahamensis* (as *albonotatus*) from a wide variety of artificial containers similar to those utilized by *Aedes aegypti* but never in association with the latter. The natural breeding sites of *bahamensis* are probably treeholes, as indicated for the female from New Providence Island, and possibly also rockholes. According to Spielman and Weyer (loc. cit.) females of *bahamensis* are normally autogenous but will occasionally take blood from man or canaries. A laboratory colony was readily established and maintained; eggs produced by autogenous females hatched in tap water after storage for 1-2 weeks at a relative humidity of 76% and a temperature of 76°F.

DISTRIBUTION (fig.3). Bahama Islands. Material examined: 45 specimens; 13 ♂, 8 ♀, 9 pupae, 15 larvae; no individual rearings.

BAHAMA ISLANDS. *Grand Bahama*: village of Hunter, artificial containers, A. Spielman (BAH-1, type series), 11 ♂, 6 ♀, 9 p, 12 L [USNM, UCLA]; 19 July 1964, tire, A. Spielman, 1 ♂ genitalia (GB 71-1), 1 L; 1 Dec 1964, tire. A. Spielman, 1 ♂ (GB 81-52A), 1 ♀ (GB 81-85A) [USNM]. *New Providence*: 1915, treehole, H.G. Dyar, 1 ♀ [USNM].

Busckii Group

FEMALE. *Head*: Narrow decumbent scales pale golden. Palpus completely dark scaled. *Thorax*: Inner dorsocentral line faint, narrow, golden; median prescutellar line narrow, golden; outer dorsocentral line faint, narrow, golden; lateral marginal line narrow, silvery, interrupted at scutal angle and sometimes caudad of it. Acrostichal bristles present on disc. Scutellum with some light scales on lateral lobes. *Ssp* with distinct silvery patch; upper *stp* patch small, separate. *Legs*: Foretarsus completely dark; midtarsus with a few basal white scales on segments 1,2; hindtarsus with short to moderate basal white rings on segments 1-3. *Abdomen*: Basomedian tergal light markings evident from segment V distad.

MALE. Palpus entirely dark. Larger claw of foreleg and midleg with submedian tooth only; smaller claw without either submedian or basal tooth.

MALE GENITALIA. Claspette with a distinct outstanding apical fingerlike cylindrical process more than twice as long as wide and bearing a short apical bristle. Clasper about 0.6 of sidepiece; subapical hairs absent. Aedeagus ovate; apex deeply emarginate, with distinct lateral lobes; subequal in length to proctiger.

PUPA. *Cephalothorax*: Hair 5-C double to 4-branched, short but longer than hair 4-C; hair 7-C double to 4-branched; hair 10-C with 2-5 branches. *Abdomen*: All large hairs except 1-II,III, 9-VII,VIII usually single or double; hair 2-II laterad of or in line with hair 3; hair 5-IV,V short, usually not reaching apex of tergite following; hair 9-II-VI usually caudad of level of hair 6; 9-VII longer, stouter and with more branches than hair 6-VII; hair 4-VIII usually single. *Paddle*: Short; apex rounded; marginal spicules distinct.

LARVA. *Head*: 1-C unbranched; 4-C moderately long, multiple; 5-C single, long; 6-C usually double or triple; hairs 11,14-C weakly stellate, 11-C with unequal branches; 15-C usually double, long, exceeding apex of mental plate. *Antenna*: Shaft with a few scattered weak sharp spicules; hair 1-A single. *Thorax*: Hair 13-P absent. Hairs 0,8,14-P, 1,13,14-M, 1,4,5,8,13-T all moderately stellate and moderately pigmented; hairs 1-M,T far mesad of hairs 2,3. *Abdomen*: Integument glabrous; hairs 2 and 9 far removed cephalad but not beyond hair 8. Hairs 1,2,5,9,13-I-VI, 11-I, 7-III-VI all moderately stellate, usually stronger than on thorax; hair 8-VII cephalodorsad of 9-VII. *Segment VIII*: Comb scales varied from 1 more-or-less regular row to 2-4 distinct rows; individual scales moderately long and broad, blunt apically and fringed. *Siphon*: Index less than 3.0; integument without spicules; small separate acus present. Pecten variable, sometimes extending to near apex; teeth always few and widely spaced, short, proximal with basal denticles. *Anal Segment*: Saddle body without distinct spicules; caudal margin with relatively short fringed spines; hair 1-X usually less than 5-branches, near lower end of caudal margin. Ventral brush with 5 pairs of hairs on a moderately sclerotized boss with short median grid bars.

DISCUSSION. Only 1 species is recognized at this time in the Busckii Group although it is evident, as indicated under the species, that there are marked differences among the populations from different islands.

The Busckii Group is immediately separated from all the other groups in the subgenus by the presence of acrostichal bristles on the disc of the mesonotum. The ornamentation of the adults is in general intermediate between the Walkeri Group and the Ioliota-Albonotatus Groups. The larvae of some populations show another primitive feature in the presence of several rows of comb scales, a condition found normally only in the Fulvithorax Group. Since the distributions of these 2 groups are now adjacent and may have overlapped in the past, the comb patch in *busckii* may have been acquired through introgression from the Fulvithorax Group. This does not seem likely because this feature is found only in the northern populations, farthest removed from Fulvithorax Section and because there is no indication of any other introgression between the 2 groups.

The Busckii Group is definitely known only from the Lesser Antilles from Sint Eustatius southward to Grenada (fig.3). This distribution is complementary to the Ioliota and Albonotatus groups except for a possible overlap with the latter in Guadeloupe.

The Busckii Group has the widest range of breeding sites in the subgenus, being found in treeholes, broken bamboo, rockholes, fallen fruits and leaves, as well as in leaf axils of bromeliads and aroids, and in flower bracts of heliconias.

16. Aedes (Howardina) busckii (Coquillett)

Figs.3,8,34,35

1906.*Stegomyia busckii* Coquillett, 1906:60-61. TYPE: Lectotype ♂, Cacao plantation, San Domingo [Dominica], 28 July 1905, A. Busck [USNM, 9139; selection of Stone and Knight 1956:215].

1919.*Aedes thaxteri* Dyar and Knab, 1919:8-9. TYPE: Holotype ♂, Grand Etang, Grenada, Nov 1912, R. Thaxter [USNM, 21704]. Synonymy with *busckii* by Dyar and Knab (1919:8).

1941.*Aedes tracei* Senevet and Quievreux, 1941:251-258. TYPE: Holotype ♂ (M 2163) with associated pupal skin and genitalia mount, near Piscine Colson, Martinique, 14 Aug 1939, G. Senevet and L. Quievreux [NE; see Belkin 1968]. Synonymy with *busckii* by Belkin, Schick and Heinemann (1965:33).

Aedes (Howardina) busckii of Bonne and Bonne-Wepster (1925:372-373); Dyar (1928:234-235); Edwards (1932:155); Lane (1939:99); Floch and Abonnenc (1945:14-16,42,45,47); Lane (1953:722-724); Stone, Knight and Starcke (1959:173); Belkin, Schick and Heinemann (1965: 17,33); Porter (1967:38).

Aedes busckii of Dyar and Knab (1906b:189,192); Howard, Dyar and Knab (1917:860-862); Dyar (1918:73,80); Senevet (1938:189); van der Kuyp (1954:39,64,68,70,72,95,96); Stone and Knight (1956:215).

Gymnometopa busckii of Coquillett (1906b:25); Theobald (1907:211; 1910:219); Surcouf and Gonzalez-Rincones (1911:212,213).

Haemagogus busckii of Coquillett (1905:183); Dyar and Knab (1906a:166).

Aedes (Howardina) thaxteri of Bonne and Bonne-Wepster (1925:276-277); Lane (1939:99).

Aedes (Soperia) tracei of Lane (1953:703-705); Stone, Knight and Starcke (1959:173); Forattini (1965:460).

FEMALE. Wing: 3.24 mm. Proboscis: 2.19 mm. Forefemur: 2.19 mm. Abdomen: about 3.0 mm. As described for the group and with following additional features. *Head*: Light scales on median stripe pale golden; creamy on sides and venter. *Thorax* (fig.8): Light patch on anterior promontory silvery. All mesonotal light lines, except lateral marginal, narrow, golden. Antealar area above paratergite with scattered dark scales. Lateral scutellar lobes with a few narrow golden and dark scales. *Legs*: Forefemur and midfemur predominantly dark anteriorly, a few creamy scales at base, posterior surface with a lateral and a median longitudinal creamy line from base to apex on forefemur and midfemur respectively, rest dark; hindfemur predominantly creamy to 0.6, lateral margin and distal area dark. *Haltere*: Stem pale, knob predominantly dark, fringe scales whitish. *Abdomen*: Sternites completely creamy on II-IV; rest of segments with basal creamy and apical dark scales.

MALE. Wing: 2.54 mm. Proboscis: 2.19 mm. Forefemur: 1.84 mm. Essentially similar to female in color.

MALE GENITALIA (fig.34). As figured; diagnostic features as described for group. Ninth tergite lobe indistinct, with 2,3 strong bristles. Sidepiece elongate, length about 3.5 median width.

PUPA (fig.34). Abdomen: 3.35 mm. Trumpet: 0.43 mm; index about 4.0. Paddle: 0.7 mm. Chaetotaxy as given below, hairs moderately pigmented. Diagnostic characters as in the key. *Cephalothorax*: Mesonotum lightly to moderately pigmented between trumpets; lateral areas and metanotum deeper; trumpets strongly contrasting. Hair 1(1), 2(1, 1-2), 3(1), 4(3, 2-4), 5(2, 2-4), 6(1, 1-2), 7(2, 2-4), 8(2, 1-3), 9(1), 10(3, 2-5), 11(1), 12(2, 1-3). *Abdomen*: Tergite I moderately pigmented and imbricate except for usual membranous areas; pigmentation progressively lighter on distal segments. Segment I: hair 1(9-14 primary branches, each with many secondary ones), 2(1, 1-2), 3(1), 4(4, 3-5), 5(3, 2-6), 6(1, 1-2), 7(2, 1-3), 9(1), 11(1, present in a few). Segment II: hair 0(1), 1(4, 3-7), 2(1, 1-2), 3(1, 1-2), 4(4, 2-5), 5(1, 1-3), 6(1, 1-2), 7(2, 1-3), 8(1, 1-3, present in many), 9(1), 11(1, present in some). Segment III: hair 0(1), 1(2, 1-3), 2(1, 1-3), 3(1, 1-2), 4(3, 2-4), 5(1, 1-4), 6(1, 1-2), 7(3, 2-4), 8(2, 2-3), 9(1), 10(2, 1-2), 11(1), 14(1). Segment IV: hair 0(1), 1(2, 1-3), 2(1), 3(3, 2-4), 4(2, 2-3), 5(2, 1-3), 6(1), 7(2, 2-4), 8(2, 1-3), 9(1), 10(2, 1-3), 11(1), 14(1). Segment V: hair 0(1), 1(1, 1-2), 2(1), 3(2, 1-3), 4(3, 3-5), 5(1, 1-3), 6(1), 7(3, 2-3), 8(2, 1-4), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1, 1-2), 2(1), 3(2, 1-3), 4(2, 2-3), 5(1, 1-2), 6(1), 7(2, 1-3), 8(2, 1-3), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(2, 1-2), 5(1, 1-2), 6(1, 1-3), 7(1), 8(1, 1-2), 9(5, 3-7), 10(1, 1-2), 11(1), 14(1). Segment VIII: hair 0(1), 4(1, 1-2), 9(7, 5-11), 14(1, 1-2). *Paddle*: Uniformly lightly pigmented, midrib slightly darker; length subequal to or slightly greater than median width; dorsal surface with minute denticles; apex rounded, external margin serrated; hair 1-P slender. Male genital lobe extending to about 0.45 of paddle, female genital lobe to 0.36.

LARVA (fig.35). Head: 0.73 mm. Siphon: 0.59 mm. Anal Saddle: 0.27 mm. Diagnostic characters as in the key. Readily separated from other members of the section by the presence of only 5 pairs of hairs in ventral brush. Chaetotaxy as given below, hairs moderately to darkly pigmented. *Head*: Width about 1.08 of length; integument moderately pigmented, deeper around mouthparts. Mental plate with a strong median tooth and usually 12(10-13) distinct teeth on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(11, 10-12), 5(1), 6(2, 2-3), 7(3, 2-5), 8(1), 9(1, 1-3), 10(1), 11(5, 4-10), 12(2, 2-3), 13(1), 14(3, 2-6), 15(2, 2-4). *Antenna*: Length about 0.3 of head; uniformly moderately pigmented, with a few scattered spicules. Hair 1-A at about 0.6 from base. *Thorax*: Apices of long hairs attenuate; stellate hairs with a few to a moderate number of branches; long and stellate hairs weakly barbed. Prothorax: hair 0(7, 6-9), 1(4, 2-5), 2(1), 3(5, 4-8), 4(4, 4-5), 5(2, 2-3), 6(1), 7(2), 8(7, 5-12), 9(2, 1-3), 10(1), 11(3, 2-3), 12(1), 14(20, 19-29). Mesothorax: hair 1(8, 4-12), 2(1), 3(1), 4(1), 5(1), 6(5, 3-5), 7(1), 8(5, 5-7), 9(6, 4-8), 10(1), 11(1, 1-3), 12(1), 13(5, 4-8), 14(7, 3-10). Metathorax: hair 1(6, 3-12), 2(1), 3(2, 1-3), 4(7, 4-10), 5(7, 5-10), 6(1), 7(5, 5-7), 8(5, 4-6), 9(4, 4-6), 10(1), 11(2, 1-3), 12(1), 13(6, 6-13). *Abdomen*: Integument and stellate hairs as on thorax. Segment I: hair 1(7, 4-11), 2(10, 7-13), 3(1), 4(2, 1-3), 5(7, 7-12), 6(5, 3-6), 7(1), 9(4, 3-5), 10(1), 11(9, 7-12), 13(5, 3-6). Segment II: hair 0(1), 1(8, 5-12), 2(12, 7-12), 3(1), 4(2, 1-2), 5(9, 7-11), 6(4, 3-6), 7(4, 2-4), 8(1), 9(5, 4-7), 10(1), 11(1), 12(1), 13(7, 4-12). Segment III: hair 0(1), 1(7, 5-12), 2(10, 8-10), 3(1), 4(1), 5(8, 8-14), 6(2, 2-3), 7(5, 4-7), 8(1), 9(9, 6-10), 10(1), 11(1), 12(1), 13(8, 4-12), 14(1, 1-2). Segment IV: hair 0(1), 1(10, 7-10), 2(10, 7-10), 3(1), 4(1), 5(9, 8-13), 6(2), 7(5, 4-7), 8(1, 1-2), 9(8, 8-10), 10(1), 11(1), 12(1), 13(8, 5-12), 14(1). Segment V: hair 0(1), 1(5, 5-12), 2(10, 7-10), 3(1), 4(1, 1-2), 5(8, 8-12), 6(2), 7(5, 4-8), 8(1), 9(9, 7-10), 10(1), 11(1), 12(1), 13(7, 5-11), 14(1, 1-2). Segment VI: hair 0(1), 1(9, 5-12), 2(8, 5-10), 3(1), 4(1), 5(9, 7-13), 6(2), 7(3, 3-5), 8(2, 1-3), 9(7, 6-10), 10(1), 11(1), 12(1), 13(5, 3-10), 14(2, 1-2). Segment VII: hair 0(1), 1(9, 4-12), 2(7, 5-10), 3(1), 4(1), 5(7, 5-11), 6(3, 3-5), 7(1, 1-2), 8(6, 5-8), 9(3, 2-4), 10(1), 11(1), 12(1), 13(3, 3-7), 14(1). *Segment VIII*: Comb scales varied from a single regular row to a distinct patch of 3,4 rows; individual scale long, blunt apically and fringed. Hair 0(1), 1(10, 6-12), 2(1), 3(7, 6-7), 4(1), 5(6, 3-10), 14(1, 1-2). *Siphon*: Index about 2.2-2.8; integument moderately pigmented, with darker basal ring. Pecten teeth few (6-10), widely spaced; frequently teeth terminate before hair 1-S, occasionally 1,2 teeth extend beyond it; individual tooth with a long spine and small basal denticle; acus distinct and separate or indistinct. Hair 1(2, 2-4), 2(1), 3-5 not visible, 6(1), 7(1), 8(1), 9(1). *Anal Segment*: Saddle moderately pigmented; caudal margin with moderately large flat spines; individual spine with lateral spinules. Gills short to moderate, broad, unequal, ventral about 0.6 of dorsal. Hair 1(2, 2-4), 2(4, 4-6), 3(1), 4a(4, 3-6), 4b(3, 3-4), 4c(4, 3-4), 4d(4, 4-5), 4e(2, 2-3).

SYSTEMATICS. *A. busckii* in the present interpretation is undoubtedly a complex of closely related and more or less strongly differentiated forms, some of which may be geographically or ecologically isolated species. It is impossible to resolve this complex at this time because of the bewildering array of differentiation and variation in ornamentation of the adults and larval characters which is apparently associated with both isolation on numerous islands and the utilization of a wide variety of breeding sites (see Bionomics below). As in the case of the *Tripteroides caledonicus* complex in the South Pacific (Belkin 1955), the situation may be further complicated through recent mixing of originally isolated insular populations by human transport.

For the present, the currently accepted synonymy of *thaxteri* with *busckii* is retained although there are rather obvious differences in ornamentation of the adults as pointed out in the original description of the former. The synonymy of *tracei*, proposed by Belkin, Schick and Heinemann (1965:33), appears to be well founded since the populations from Martinique are very similar to those from Dominica.

The above diagnosis of the complex is based primarily on topotypic associated material of all stages of *busckii* from Dominica. In the adults, the most striking differences in the various populations are: (1) in the nature of the lateral mesonotal silvery line which may be nearly continuous from the anterior promontory to the wing root or variously broken into segments, (2) in the extent of the basal white ring on hindtarsal segment 3 which varies from less than 0.4 to almost 0.75 of the segment length, and (3) the presence of some white scales on additional tarsal segments. No striking differences have been noted in the pupae but the larvae of different populations show remarkable differentiation from the typical population in: (1) the number and arrangement of scales in the comb from a few scales in a single even row to a large number in a patch of 3 or 4 rows, and (2) the distribution of the pecten which may end before the siphonal tuft or may reach nearly to the tip of the siphon.

The northern populations from Sint Eustatius, St. Kitts, Montserrat and Guadeloupe differ from all the others in the more extensive white ring on hindtarsal segment 3, the larval comb in a large patch and the pecten ending before the siphonal hair tuft. The male genitalia of these populations are also apparently distinct from the others in the large number of setae on the tergal surface of the sidepiece and in a broad aedeagus with distinct apicolateral lobes. Although these populations probably represent a distinct species, I prefer not to name or describe it formally without additional material and a thorough study of the entire complex which is beyond the scope of the present revision.

The *busckii* complex is apparently restricted to the main chain of the Lesser Antilles from Sint Eustatius southward to Grenada. I have seen material only from the above-mentioned islands and from St. Kitts, Montserrat, Guadeloupe, Dominica, Martinique and St. Lucia. No material of the complex was found in a recent survey of Nevis and St. Vincent but it is likely that populations will be found there as well as on the smaller intermediate islands of the chain. The report of *busckii* from Jamaica by Hill and Hill (1948:43) is probably based on an erroneous identification of a member of the Aurites Group and its record from the Dominican Republic is due to the error in labeling the type material San Domingo instead of Dominica (see Howard, Dyar and Knab 1917:860).

BIONOMICS. Members of the *busckii* complex have been found breeding in the entire range of habitats utilized by the subgenus, in rockholes, treeholes, broken and cut bamboo, fallen leaves, fruits and pods, in the leaf axils of bromeliads and aroids, and in the flower bracts of heliconias. The immature stages are also commonly found in a variety of artificial containers. One male (FWI 245) from Guadeloupe is reported from a ground pool but this may be a contamination or an error in labeling. Females are frequently taken in biting-landing collections and some were obtained on chicken bait. Apparently some adult populations may reach high levels and become serious pests locally.

DISTRIBUTION (fig.3). Main chain of the Lesser Antilles from Sint Eustatius to Grenada; reported from low (40 ft) to moderate (2600 ft) elevations. Material examined: 1269 specimens; 253 ♂, 273 ♀, 290 pupae, 453 larvae; 175 individual rearings (19 pupal, 131 larval, 25 incomplete).

DOMINICA. *St. Andrew*: Calibishie, 23 June 1965, colocasia leaf axil, R. Martinez and A. Guerra, 1 p, 2 l (DOM 137), 2 lp♂ (138-10,11), 1 lp♀ (138-13), 1 P (DOM 138) [UCLA]. *St. David*: Castle Bruce, 19 Apr 1959, bamboo, R.H. Darsie, 1 lp♂ (76-14), 2 p♂ (76-15A,16), 1 ♂ (76-10), 1 lp♀ (76-6), 4 ♀ (76-2,4A,7,11), 1 lP, 1 P [USNM]. Grand Fond, elev. 300 ft, 18 June 1965, biting collection, R. Martinez and A. Guerra, 1 ♀ (DOM 116) [UCLA]. Terre Ferme, elev. 1800 ft, 22 June 1965, heliconia bract, R. Martinez and A. Guerra (DOM 131), 1 lp♂ (131-12), 1 lp♀ (131-11), 6 ♂, 12 p, 2 L [UCLA]. *St. George*: L'Etang, elev. 2600 ft, 8 June 1965, bromeliads, T.H.G. Aitken, R. Martinez and A. Guerra, 1 p (DOM 53) [UCLA]. Trafalgar Falls, elev. 1700 ft, 9 June 1965, biting collection, R. Martinez and A. Guerra, 4 ♀ (DOM 58); heliconia bract (DOM 59), 2 lp♀ (59-10,11), 1 P, 1 p [UCLA]. *St. Joseph*: Batati Estate, elev. 40 ft, 14 June 1965, treehole, R. Martinez and A. Guerra (DOM 82), 1 lp♀ (82-20) [UCLA]. Clarke Hall Estate, 12 Nov 1964, P.J. Spangler, 1 ♀; 11 Mar 1964, D.F. Bray, 2 ♀; 21-31 Jan 1965, W.W. Wirth, 3 ♀; 24 Jan 1965, W.W. Wirth, 2 ♀; 3 May 1966, R.J. Gagne, 1 ♀; 11 May 1966, G. Steyskal, 1 ♀; 19 May 1966, G. Steyskal, 1 ♀; 24 May 1966, G. Steyskal, 3 ♀; 1 June 1966, G. Steyskal, 1 ♀; 3 June 1966, G. Steyskal, 1 ♀; 10 June 1966, G. Steyskal, 6 ♀; 11 June 1966, G. Steyskal, 2 ♀; 12 June 1966, G. Steyskal, 1 ♀; 10 Oct 1966, A.B. Gurney, 1 ♀ [USNM]. *St. John*: Milton Estate, elev. 1000 ft, 24 June 1965, heliconia bract, A. Guerra (DOM 159), 2 lp♂ (159-10,13), 1 p♂ (159-101), 2 P, 4 p, 14 L [UCLA]. *St. Luke*: Point Michele, Champigny Estate, elev. 600-700 ft, 6 June 1965, treehole, T.H.G. Aitken, R. Martinez and A. Guerra, 2 lp♂ (15-20,22), 1 lp♀ (15-23), 1 P, 1 p, 1 l (DOM 15), 1 lp♂ (19-10), 4 ♂, 8 p, 7 L (DOM 19), 4 L (DOM 20), fallen leaf, 1 lp♀ (17-10), 2 p, 6 L, 2 l (DOM 17), steel drum, 3 ♂, 1 ♀ (DOM 21), heliconia bract, 4 ♂, 1 ♀ (DOM 23) [UCLA]. *St. Mark*: Tete Morne, elev. 1400 ft, 10 June 1965, heliconia bract, R. Martinez and A. Guerra (DOM 68), 2 lp♂ (68-12,14), 2 lp♀ (68-11,13), 4 ♂, 8 p, 4 L [UCLA]. *St. Paul*: Antrim Valley, 7 June 1965, treehole, R. Martinez and A. Guerra, 4 ♀, 4 p, 4 L (DOM 35) [UCLA]. Mount Joy, elev. 1000 ft, 7 June 1965, treehole, R. Martinez and A. Guerra (DOM 41), 1 lp♂ (41-15), 2 lp♀ (41-10,11), 1 P, 11 L [UCLA]. Pont Casse, 23 Nov 1964, P.J. Spangler, 1 ♂ [USNM]. *Parish not specified*: July 1905, in sugar boiler full of vegetation, 1 ♂, 1 ♀ (78), type series [USNM no. 9139].

GRENADA. *St. Andrew*: Balthazar Estate, elev. 450 ft, 15 Oct 1963, bamboo, R. Martinez, 1 lp♂ (43-125), 1 lp♂ (44-136), 1 lp♀ (44-131) [UCLA]. Mt. St. Catherine, elev. 2000 ft, 25 Oct 1963, bamboo, R. Martinez, 2 L (GR 82), heliconia bract, 2 ♀ (GR 85) [UCLA]. *St. David*: Minorca Estate, elev. 700 ft, 24 Oct 1963, colocasia leaf axil, R. Martinez, 3 L (GR 76); 1 Nov 1963, fallen cacao pod, R. Martinez (GR 111), 1 lp♂ (111-18) [UCLA]. *St. George*: Annandale, elev. 700 ft, 25 Aug 1929, leaf axil, F.M. Root, 18 ♂, 24 ♀ (LAR 40), 5 ♀ (LAR 40A); 28 Oct 1963, bamboo, R. Martinez, 1 L (GR 95), rockhole (GR 96), 1 lp (96-156) [UCLA]. Grand Etang, 2 July 1929, F.M. Root, 20 ♂, 40 ♀ (GRR 11); 26 Aug 1929, leaf axil, F.M. Root, 21 ♂, 4 ♀ (LAR 42); 17 Oct 1963, heliconia bract, R. Martinez (GR 54), 1 lp♀ (54-132), bamboo (GR 59), 1 lp♂ (59-133), fallen palm leaf, 9 ♂, 3 ♀ (GR 60), heliconia bract (GR 61), 1 lp♂ (61-127), 1 lp♀ (61-139); 18 Oct 1963, biting collection, R. Martinez, 1 ♀ (GR 62); 23 Oct 1963, heliconia bract, R. Martinez (GR 67), 1 lp♂ (67-140), 1 ♂ [UCLA]. *St. Mark*: Concord, F.M. Root, 27 ♂, 15 ♀ (GRR 80) [UCLA].

Parish not specified: F.M. Root, 11 ♂, 29 ♀ (GRR 40) [UCLA].

GUADELOUPE. *Basse-Terre*: Capesterre, 76 L, Matouba, 72 L; Petit-Bourg, 17 L; Pointe-Noire, 12 L (Floch and Abonnenc 1945:16). Route de Traversee, km 4-6, elev. 200 ft, 18 Sept 1965, ground pool, P. Fauran, 1 ♂ (FWI-245) [UCLA]. St. Claude, Bains Jaunes, elev. 900 ft, 31 Mar 1965, heliconia bract, P. Fauran, 2 lp♂ (211-12,13), 5 lp♀ (211-10,11,15-17), 2 lP (211-14,18), 4 lp♂ (212-11,13,15,16), 2 lp♀ (212-10,14), 1 lP (212-12) [UCLA]. Soufriere, 111 L; Trois-Rivieres, 51 L (Floch and Abonnenc 1945:16). Vernou, elev. 300 ft, 20 July 1964, treehole, P. Fauran (FWI 182), 4 lp♂ (182-101,102,105,107), 6 lp♀ (182-103,106,108,110,112,113), 1 lP (182-111), 2 L [UCLA]. Locality not specified, elev. 3000 ft, July 1905, wild canna, A. Busck, 1 lp♂ (80-10), 2 ♀ (80-3,7), 3 ♂, 4 ♀ [USNM].

MARTINIQUE. Fort de France, 1929, bamboo, F.M. Root, 2 ♂ (LAR 23), bromeliads, 1 ♀ (LAR 28A) [UCLA]; Route de la Trace, elev. 680 ft, 16 July 1965, heliconia bract, P. Fauran (FWI-M2), 2 lp♂ (M2-10,11), 1 lp♀ (M2-14), 3 p♂ (M2-15,101,102), 2 p♀ (M2-12,100), 1 lP (M2-13), 3 p, 1 l [UCLA]. Mt. Pelee, July 1905, A. Busck, 2 ♀ [USNM]. Piscine Colson, 14 Aug 1939 (Senevet and Quievreux 1941:263).

MONTSERRAT. *St. Antony*: Chance Mountain, elev. 2600 ft, 5 Oct 1966, treehole, T.H.G. Aitken, R. Martinez and A. Guerra, 2 P, 10 L (MNT 25), 2 lp♂ (28-10,11), 1 lp♀ (28-13), 1 p♂ (28-100), 2 lP (28-12,14), 19 L (MNT 28), 1 lp♂ (29-10), 2 lp♀ (29-11,12), 3 L (MNT 29), heliconia bract (MNT 27), 4 lp♂ (27-12,13,15,16), 2 lp♀ (27-10,14), 1 p♂ (27-100), 1 lP (27-17), 5 L [UCLA]. Parsons Estate, elev. 500 ft, 13 Oct 1966, tin can, R. Martinez and A. Guerra (MNT 72), 1 lP (72-10), 9 L [UCLA]. Soufriere, elev. 1000 ft, 12 Oct 1966, bamboo, R. Martinez and A. Guerra, 1 lP (66-10), 1 p, 5 L (MNT 66), 5 L (MNT 67) [UCLA]; Lower Gages, 1250 ft, 6 Oct 1966, treehole, R. Martinez and A. Guerra, 8 L (MNT 36) [UCLA]; Upper Gages, 1750 ft, 6 Oct 1966, heliconia bract, T.H.G. Aitken, R. Martinez and A. Guerra (MNT 38), 1 lp♂ (38-10), 1 p♂ (38-100), 1 p♀ (38-101), 5 L [UCLA]. Waterworks Estate, elev. 550 ft, 18 Oct 1966, treehole, R. Martinez and A. Guerra (MNT 118), 1 p♀ (118-100), 1 lP (118-20) [UCLA]. *St. Peters*: Plymouth, Belham Bridge, elev. 250 ft, 4 Oct 1966, tin can, T.H.G. Aitken, R. Martinez and A. Guerra (MNT 20), 2 lp♂ (20-11,12), 1 lp♀ (20-10), 1 p♂ (20-100), 1 p♀ (20-101), treehole (MNT 22), 1 lp♂ (22-14), 3 lp♀ (22-10-12), 1 lP (22-13), 9 ♂, 3 ♀, 12 p [UCLA].

SINT EUSTATIUS. 7 Oct 1947, E. van der Kuyp, 2 ♂, 1 ♀ [USNM].

ST. KITTS. *Christ Church*: Old Road Town, elev. 1200 ft, 5 Sept 1966, heliconia bract, A. Guerra, 1 ♂, 2 ♀; 5 Sept 1966, R. Martinez and A. Guerra, 1 p♀ (93-101), 2 ♂, 1 ♀ (KIT 93), 1 ♂, 4 ♀ (KIT 94) [UCLA]. *St. John*: Dieppe Bay Town, slopes of Mount Misery, elev. 2500 ft, 17 Aug 1966, treehole, T.H.G. Aitken, R. Martinez and A. Guerra (KIT 25), 1 lp♀ (25-10), 1 lP (25-11), 6 ♂, 2 ♀, 8 p, 1 L [UCLA].

ST. LUCIA. *Anse la Raye*: Elev. 300 ft, 15 July 1964, treehole, R. Martinez and A. Guerra, 1 L (LU 30); 30 July 1964, fallen fruit, A. Guerra, 1 lp♀ (125-20), 1 p♀ (125-100), 1 lp♂ (126-20), 4 L (LU 126), treehole (LU 128), 7 lp♀ (128-10-16), 1 lP (128-17), 26 ♂, 10 ♀, 19 P, 11 L [UCLA]; Derriere Dos, 31 July 1964, fallen cacao pod, A. Guerra (LU 131), 1 lp♂ (131-24), 5 lp♀ (131-20-23,25), 4 ♂, 12 ♀, 8 p [UCLA]. Barre de L'Isle, elev. 800-900 ft, 14 July 1964, treehole, T.H.G. Aitken, R. Martinez and A. Guerra, 3 lp♂ (14-14-16), 6 lp♀ (14-10-13,18,19), 8 p, 7 L, 3 l (LU 14), 2 ♀ (LU 16), 1 ♀ (LU 18); 1 Aug 1964, treehole, R. Martinez and A. Guerra, 3 L (LU 143); 6 Aug 1964, bamboo, R. Martinez and A. Guerra, 14 L (LU 159), 20 L (LU 160), 3 lp♂ (161-12,13,14), 1 lP (161-13), 3 p (LU 161) [UCLA]. *Castries*: Bise Quarry, elev. 250 ft, 17 July 1964, treehole, R. Martinez and A. Guerra (LU 46), 3 lp♀ (46-20,22,23), 2 lP (46-21,24), 3 L, 1 l [UCLA]. Cul de Sac Estate, 30 July 1964, chicken bait, R. Martinez and A. Guerra, 2 ♀ (LU 129) [UCLA]. Delgos, elev. 750 ft, 14 July 1964, bamboo, T.H.G. Aitken, R. Martinez and A. Guerra, 3 lp♂ (10-11,13,15), 2 lp♀ (10-12,14), 1 lP (10-16), 1 P, 7 L (LU 10), 3 lp♀ (11-13-15), 1 p♀ (11-101), 3 lP (11-10,12,18), 1 p, 7 L (LU 11), 3 lp♀ (12-10-12), 3 L (LU 12), treehole (LU 13), 2 L, 1 l [UCLA]. Grande Anse, elev. 175 ft, 20 July 1964, heliconia bract, R. Martinez and A. Guerra, 1 L (LU 62), bamboo (LU 63), 1 lp♂ (63-11), 4 lp♀ (63-10,12-14), 1 p♂ (63-101), 2 L, 1 l [UCLA]. La Croix Junction near Poix Bouche, elev. 500 ft, 20 July 1964, treehole, R. Martinez and A. Guerra (LU 59), 1 lp♂ (59-10), 6 L [UCLA]. Marquis Estate, elev. 200 ft, 20 July 1964, fallen cacao pod, R. Martinez and A. Guerra, 1 ♂, 1 ♀, 1 p, 3 L (LU 60), fallen cocoanut (LU 61), 2 lp♀ (61-10,13), 1 p♀ (61-11), 16 L [UCLA]. Piton Flor, elev. 1875 ft, 4 Aug 1964, bamboo, R. Martinez and A. Guerra (LU 146), 1 lp♂ (146-10), 1 L [UCLA]. Union Agricultural Station, elev. 200 ft, 16 July 1964, bamboo, R. Martinez and A. Guerra (LU 42), 1 lp♀ (42-10), 3 lP (42-11,13,14), 10 L [UCLA]. Waterworks Road, 20 July 1964, bromeliads, R. Martinez and A. Guerra (LU 67), 1 p♀ (67-100) [UCLA]. *Micoud*: Mahaut, elev. 700 ft, 27 July 1964, heliconia bract, A. Guerra (LU 101), 2 lp♂ (101-14,15), 2 lp♀ (101-12,13), 1 lP (101-11), 9 L [UCLA]. Mon Repos, elev. 300 ft, 28 July 1964, bromeliads, A. Guerra (LU 104), 1 lp♂ (104-11), 6 L [UCLA]. *Soufriere*: Soufriere, elev. 220-500 ft, 20 July 1964, heliconia bract, R. Martinez and A. Guerra, 2 L (LU 78), bamboo (LU 80), 4 lp♂ (80-10-13), 2 lp♀ (80-14,15), 10 L; 22 July 1964, fallen cacao pod, R. Martinez and A. Guerra (LU 83), 1 lp♀ (83-11), 3 L [UCLA].

SEXLINEATUS SECTION

FEMALES. Medium sized to rather large species, wing 2.7-5.0 mm. *Head*: Submedian and lateral dark patches broad, distinct. Erect scales restricted to occiput. Torus dark brown to almost black, with light scales restricted usually to mesal surface. Palpus with or without apical light scales. *Thorax*: Mesonotum always with distinct linear light pattern, light lines of same color throughout, white, creamy or golden (except in *ecuadoriensis*). Acrostichal line not developed but a small patch of light scales present at anterior promontory; inner and outer dorsocentral lines usually long, both reaching scutellum; lateral marginal line usually continuous (broken in Whitmorei Group); median prescutellar line not developed. Paratergite with scales. Acrostichal bristles absent on disc. Pleural scales silvery, white or creamy; *ppn* and *ssp* with scales; *psp* usually with scales (usually absent in Allotecnon Group); *mep* with separate upper and lower patches. *Legs*: Midfemur and hindfemur sometimes with distal white spots on anterior surface. All tibiae usually completely dark (except Sexlineatus and Whitmorei Groups). Tarsal light markings not restricted to segment 1. *Wing*: Light scales present on remigium in Aurivittatus Group, absent in others. *Abdomen*: Sternites II-IV with dark scales distally.

MALES. Larger claw of foreleg and midleg with submedian tooth only.

MALE GENITALIA. Lobes of tergite IX either poorly defined or distinct, bearing a few to many strong to moderate setae. Sidepieces separated from each other at base by a distance less than diameter of aedeagus at that level (greater in Whitmorei Group); tergomesal and/or sternomesal margins with lobes only in Whitmorei Group. Claspette completely absent in Whitmorei Group, represented in other groups by sternal basomesal lobe not connected across midline and bearing 1 apical seta.

PUPAE. *Cephalothorax*: Hair 5-C longer than distance between its base and that of trumpet, strong and always double, at least 2.0 of hair 4-C. *Abdomen*: Hair 5-IV, V strong, usually double, extending distinctly beyond apex of tergite following; 2-IV-VI usually within basal 0.6 of its tergite; hair 9-III-VI distinctly cephalo-laterad of hair 6; 9-VII moderate to strongly developed, removed considerable distance cephalad of hair 6.

LARVAE. Stellate hairs always strongly developed. *Antenna*: Short to moderate; shaft with scattered spicules; hair 1-A usually 2,3-branched. *Thorax*: Integument with or without spicules. Tubercles of hairs 5-7-P distinctly joined; hair 9-P with more than 4 branches and faintly stellate; 13-P present, distinctly stellate. *Abdomen*: Integumentary spiculation strong or weak, sometimes confined to dorsal or ventral surface, spicules usually hairlike (spinelike in Allotecnon Group). Hairs 1,2,5,11,13-I, 1,2,5,7,9 (and usually 13)-II-VII stellate; hair 8-VII cephalodorsad or caudodorsad of 9-VII. *Segment VIII*: Hair 1,5-VIII usually stellate. Comb scales in a single row; individual scales long, pointed apically. *Siphon*: Index 2.0-4.3; integument smooth, imbricate or spiculate. Acus distinct, separate or attached. Pecten teeth with basal denticles. *Anal Segment*: Saddle with distinct marginal spicules. Hair 1-X moderate, with few branches; 3-X single or double; 2-X multiple. Ventral brush with 5 or 6 pairs of hairs arising from a boss with distinct grid bars.

DISCUSSION. The ornamentation pattern of the adults of the Sexlineatus Section is superficially so similar in most species that few specimens have been correctly identified in the past and many distinct species were not recognized until in the present study correlated differences were found in the immature stages. On the whole, the section is a homogeneous one and strongly differentiated from the other 2 sections in all stages as indicated in the keys and diagnosis. As far as is known, members of this section breed only in bromeliad axils.

The Sexlineatus Section is primarily associated with the great cordilleras of Central America and western South America. Apparently only the monotypic Sexlineatus Group and the Whitmorei Group penetrate eastward into the lowlands of the Orinoco and the smaller northern South American drainages and no species extends even to the Guianas. There are only small extensions from the Andes down into moderate elevations near the headwaters of the Orinoco, Amazon and La Plata basins (fig.1).

Only 2 of the 6 groups recognized here for the 19 species are strongly differentiated: (1) the Quadrivittatus Group which is confined to Middle America and appears to have retained the most significant primitive features in the section, and (2) the Whitmorei Group which is known in Colombia, Venezuela and Bolivia but undoubtedly also occurs in Ecuador and Peru; this is the most derived group in the section. The remaining 4 groups show considerable overlap in many characters although the Sexlineatus and Allotecnon Groups each have a characteristic facies in the adult and larval stages. The Eleanorae Group in many respects appears intermediate between the Quadrivittatus and the Allotecnon Groups. The separation of the Aurivittatus Group from the Eleanorae Group is based only on the presence of light scales on the remigium of the wing of the former; when the immature stages are known the 2 taxonomic groups may have to be merged.

Two of the groups, Quadrivittatus and Allotecnon, are confined to Middle America where they are sympatric and extend northward to southern and central Mexico. The monotypic Sexlineatus Group overlaps with the above throughout their range in Middle America but is apparently not completely sympatric with them; it further extends along the Pacific coast to the Gulf of Guayaquil and along the southern Caribbean shores to Trinidad; it is the only species of the section to be found near sea level. The Whitmorei, Eleanorae and Aurivittatus Groups are confined to South America. The dominant Eleanorae Group is primarily Andean and has a wide distribution from western Venezuela and Colombia down to Bolivia, with slight intrusions into the upper Orinoco and Amazon basins. The Aurivittatus Group is known only from the upper drainages of the Amazon and La Plata in Bolivia and northern Argentina respectively. The Whitmorei Group has been found in Colombia, Venezuela and Bolivia and has small intrusions into the upper Orinoco, Amazon and La Plata drainages.

Both in Middle and South American groups, some members of a given group seem to occur sympatrically, others are allopatric and still others appear to be ecologically isolated (in the Eleanorae Group) although broadly sympatric.

KEYS TO GROUPS AND SPECIES

ADULTS

1. Midfemur without any indication of a white or silvery spot or streak on anterior surface above ventral light line (Quadrivittatus Group) 2
Midfemur with a more or less distinct white or silvery spot or streak on anterior surface above ventral light line 4

Quadrivittatus Group

2(1). Outer dorsocentral line not reaching lateral marginal line anteriorly . . . . *19. brevis; 20. spinosus*
Outer dorsocentral line connected to lateral marginal line anteriorly . . . 3

3(2). *Ppn* scales predominantly narrow and yellowish; *ssp* scales in a restricted linear patch not connected to *ppn* patch; first flagellar segment with dark scales . . . . *17. quadrivittatus*
Ppn scales predominantly broad and white; *ssp* scales extending toward *ppn* patch, the 2 patches usually connected; first flagellar segment with white scales . . . . *18. lorraineae*

4(1). Antealar area (above paratergite) with numerous dark bronzy scales below narrow supraalar golden line (Sexlineatus and Whitmorei Groups) . . . 5
Antealar area with whitish, yellowish or golden scales only, so that lateral marginal and supraalar lines are united 7

Sexlineatus Group

5(4). Outer dorsocentral line reaching anterior border of mesonotum; torus with small mesal patch of white or whitish scales. . . . . . . *21. sexlineatus*
Outer dorsocentral line not reaching anterior border of mesonotum, directed outward toward lateral mesonotal line in fossa; torus with a broad ring of white or silvery scales interrupted only dorsally (Whitmorei Group) . . 6

Whitmorei Group

6(5). Hindtarsal white rings on segments 1,2 and 3; anterior end of outer dorsocentral line with a patch of broad silvery scales . . . . *22. whitmorei*
Hindtarsal white rings on segments 1 and 2 only; anterior end of outer dorsocentral line without patch of broad silvery scales . . *23. pseudodominicii*

7(4). Base of vein R (remigium) with white or whitish scales 8
Base of vein R with dark scales as elsewhere. 10

Aurivittatus Group

8(7). Hindtarsal white ring on segment 1 only; haltere knob with white scales only . . . . *35. vanemdeni*
Hindtarsal white rings on segments 1,2 and 3; haltere knob with both dark and light scales 9

9(8). Outer dorsocentral line reaching anterior border of mesonotum; lateral marginal line poorly developed in front of scutal angle, without broadened scales . . . . *33. aurivittatus*
Outer dorsocentral line not reaching anterior border of mesonotum; lateral marginal line strongly developed in front of scutal angle, with broadened scales . . . . *34. martinezi*

Eleanorae Group

10(8). Hindtarsus with basal white rings on segments 1 and 3 only. . *27. eleanorae*
Hindtarsus with basal white rings on segments 1,2, 1-3 or 1-4 11

11(10). Hindtarsus with basal white rings on segments 1-4 12
Hindtarsus with basal white rings on segments 1,2 or 1-3 only. 13

12(11). Inner dorsocentral line white, usually very narrow; *ppn* with narrow curved light scales in upper part and broad flat white scales in lower; *ssp* scale patch extended upward toward *ppn* broad scales; hindtarsal markings broad, on segment 4 about 0.5 of segment length . . .*31. ecuadoriensis*
Inner dorsocentral line yellowish, usually broadened anteriorly; *ppn* predominantly with moderately broad, curved, light scales throughout; *ssp* scale patch entirely linear, not extended to *ppn* scales; hindtarsal markings narrower, on segment 4 usually less than 0.2 of segment length . . . . *32. brevivittatus*

13(11). Hindfemur without silvery spot on the anterior surface; *ssp* scale patch narrow, linear and not extended toward *apn* or *ppn* scale patches. . . . 14
Hindfemur with a very distinct silvery spot on dark portion of anterior surface not connected to basal ventral light streak; *ssp* scale patch short and broad and extended toward *apn* and *ppn* scale patches (Allotecnon Group) 16

14(13). Midfemoral light patch or spot at about 0.5. . . . . *30. osornoi*
Midfemoral light patch at about 0.67 or distad 15

15(14). Outer dorsocentral line strongly broadened anteriorly and joining lateral mesonotal line . . . . *28. marinkellei*
Outer dorsocentral line not strongly broadened anteriorly and not joining lateral mesonotal line . . . . *29. leei*

Allotecnon Group

16(13). Hindtarsus with basal white rings on segments 1 and 2 only . . . . *26. guatemala*
Hindtarsus with basal white rings on segments 1-3. 17

17(16). *Ppn* with pure white broad flat scales except for narrow upper border of yellowish curved moderately broad scales; *psp* scales usually present. . . . . *25. guerrero*
Ppn predominantly with yellowish, narrow to moderately broad, curved

scales throughout except at lower posterior angle where a few broad white flat scales may be present; *psp* scales absent . . . . *24. allotecnon*

MALE GENITALIA

(*18. lorraineae; 25 guerrero; 26 guatemala; 28. marinkellei;* and *34. martinezi* unknown; *35. vanemdeni* not included)

1. Claspette completely absent 2
Claspette represented by a small sternomesal lobe bearing a differentiated apical seta 3

2(1). Tergomesal and sternomesal margins of sidepiece with row of flattened foliform setae . . . . *22. whitmorei*
Tergomesal and sternomesal margins of sidepiece with simple bristles . . . . *23. pseudodominicii*

3(1). Apex of aedeagus in dorsal aspect uniformly sclerotized, smoothly rounded, without indication of apical lateral lobes or apical horns . . . . *21. sexlineatus*
Apex of aedeagus deeply emarginate and with distinct long apical horns; *or* dorsal sclerotization more or less emarginate apically, producing lateral sclerotized lobes 4

4(3). Apex of aedeagus with slender horns, bent dorsad . *19. brevis; 20. spinosus*
Dorsal sclerotization of aedeagus more or less deeply emarginate, producing lateral sclerotized lobes 5

5(4). Spiniform of clasper short and thick, usually less than 0.25 of clasper length 6
Spiniform of clasper long and slender, usually at least 0.33 of clasper length 9

6(5). Aedeagus longer than proctiger . . . . *29. leei*
Aedeagus shorter than or subequal to proctiger 7

7(6). Inner setae of ninth tergite lobe very markedly flattened, almost leaflike . . . . *31. ecuadoriensis*
Inner setae of ninth tergite lobe thickened but not markedly flattened . . 8

8(7). Dorsal sclerotization of aedeagus deeply emarginate, lateral apical lobes conspicuous . . . . *17. quadrivittatus*
Dorsal sclerotization of aedeagus shallowly emarginate, lateral apical lobes inconspicuous . . . . *24. allotecnon*

9(5). Spiniform of clasper about 0.5 of clasper length . . . . *27. eleanorae; 33. aurivittatus*
Spiniform of clasper less than 0.4 of clasper length 10

10(9). Dorsal sclerotization of aedeagus deeply emarginate, lateral apical lobes conspicuous . . . . *32. brevivittatus*

Dorsal sclerotization of aedeagus shallowly emarginate, lateral lobes inconspicuous . . . . 30. *osornoi*

PUPAE

(23. *pseudodominicii; 26. guatemala; 31. ecuadoriensis; 32. brevivittatus; 33. aurivittatus; 34. martinezi* and 35. *vanemdeni*
unknown; 18. *lorraineae* and 25. *guerrero* not included)

1. Trumpet short and broad, index about 3.0 . . . . 22. *whitmorei*
Trumpet long and narrow, index over 5.0 2

2(1). Hairs 10,11,12-C all single 3
At least one of these hairs branched, usually 10-C. 4

3(2). Hair 8-VII on dorsal surface . . . . 29. *leei*
Hair 8-VII on ventral surface . . . . 28. *marinkellei*

4(2). Hair 8-VII on dorsal surface, strongly developed . . . . . . 27. *eleanorae*
Hair 8-VII on ventral surface, weak 5

5(4). Paddle deeply emarginate at hair 1 . . . . .19. *brevis*
Paddle rounded or produced at hair 1 6

6(5). Hair 5-IV-V moderate, not exceeding apex of second tergite following . . 7
Hair 5-IV-V very long, exceeding apex of second tergite following 8

7(6). Hair 9-VII weak and short, barely reaching lateral angle of tergite . . . . 30. *osornoi*
Hair 9-VII stronger and longer, extending beyond lateral angle of tergite. . . . . 21. *sexlineatus*

8(6). Hair 1-II usually double or triple; 9-VIII with 3,4 branches . . . . .24. *allotecnon*
Hair 1-II usually at least 5-branched; 9-VIII with at least 4 branches . . 9

9(8). Hair 9-VIII usually at least 8-branched; 9-VII at least 4-branched. . . . . 17. *quadrivittatus*
Hair 9-VIII usually 6-branched; 9-VII double . . . . .20. *spinosus*

LARVAE

(23. *pseudodominicii;* 26 *guatemala;* 31. *ecuadoriensis;*
32. *brevivittatus;* 33. *aurivittatus;* 34. *martinezi and*
35. *vanemdeni* unknown)

1. Ventral brush with 6 pairs of hairs (Quadrivittatus Group) 2
Ventral brush with 5 pairs of hairs 5

Quadrivittatus Group

2(1). Siphon without spicules visible at 100X; hair 12-C double 3

Siphon distinctly spiculate at 100X; hair 12-C stellate, with many branches 4

3(2). Hair 5-C usually with 5 branches . . . . *17. quadrivittatus*
Hair 5-C usually with 3,4 branches . . . . *18. lorraineae*

4(2). Hair 5-C usually with more than 10 branches (11-22); siphon index about 2.0 . . . . *.19. brevis*
Hair 5-C usually 5-branched (4-7); siphon index about 3.0 . . *20. spinosus*

Whitmorei Group

5(1). Siphon with distinct spicules visible at 100X . . . . *22. whitmorei*
Siphon without spicules visible at 100X 6

6(5). Hair 15-C usually triple, very short, at most reaching level of base of mental plate 7
Hair 15-C usually single or double, moderate in length, reaching level of middle of mental plate (Eleanorae Group) 9

Sexlineatus Group

7(6). Thoracic and abdominal integument with dense vestiture of hairlike spicules . . . . *.21. sexlineatus*
Thoracic integument glabrous at 100X, abdominal with restricted dorsal and ventral patch of small spinelike spicules (Allotecnon Group) 8

Allotecnon Group

8(7). Anal saddle with distinct large caudal marginal spicules ventrad of hair 1-X. . . . . *.24. allotecnon*
Anal saddle without any caudal marginal spicules ventrad of hair 1-X . . . . *.25. guerrero*

Eleanorae Group

9(6). Siphonal hair 1-S within last pecten tooth; hair 5-C with more than 5 branches . . . . *27. eleanorae*
Siphonal hair 1-S distad of last pecten tooth; hair 5-C single or double . 10

10(9). Hair 3-X single . . . . *30. osornoi*
Hair 3-X double 11

11(10). Siphonal hair 1-S usually single and strongly barbed, rarely double; stellate hairs all shorter than saddle length, abdominal hairs 1 and 2 usually with about 10-15 branches . . . . *28. marinkellei*
Siphonal hair 1-S usually triple or double; many stellate hairs distinctly longer than saddle, abdominal hairs 1 and 2 usually with 20 or more branches . . . . *29. leei*

Quadrivittatus Group

FEMALES. *Head*: Median light line on vertex with narrow scales. Proboscis distinctly longer than forefemur. Torus with a restricted mesal scale patch. *Thorax*: Mesonotal light lines usually creamy to golden; inner dorsocentral line complete; outer dorsocentral line either complete or incomplete, not reaching anterior margin; lateral marginal line continuous; scales on anterior promontory golden. Antealar area above paratergite with golden scales. Paratergite with a moderate scale patch extending entire sclerite length. Upper *ppn* entirely covered with light scales; upper *stp* patch quadrate. *Legs*: Distal white spot on anterior surface of midfemur and hindfemur absent. Tibiae completely dark. *Wing*: Veins entirely dark scaled. *Abdomen*: Basomedian tergal light markings absent.

MALES. Palpus entirely dark scaled.

MALE GENITALIA. Lobe of tergite IX prominent to indistinct, bearing few (3-5) strong or many (8-10) moderate bristles. Sidepieces separated at base by a distance less than width of aedeagus; without any indication of lobes on tergomesal or sternomesal margins. Claspette represented by a conical tubercle. Aedeagus shorter than proctiger; apex moderate to deeply emarginate, producing lateral lobes or horns.

PUPAE. *Cephalothorax*: Trumpet moderate, index about 5.5-6.0, not expanded apically; hair 10-C at least 5-branched; 12-C single, rarely double. *Abdomen*: Hair 5-IV-V moderate to long, usually exceeding apex of second tergite following (except in *brevis*); hair 9-VII distinctly stronger than hair 6, exceeding lateral angle of tergite. *Paddle*: Moderate to long; apex usually produced (emarginate in *brevis*).

LARVAE. *Head*: Hairs 4-7-C moderately pigmented, long, all at least 5-branched; hair 15-C long, exceeding apex of mental plate. *Thorax*: Roundish in outline, integument densely spiculate, spicules hairlike, simple or branched. *Abdomen*: Integument strongly uniformly spiculate. Hair 8-VII slightly cephalodorsad of 9-VII. *Siphon*: Integument imbricate or spiculate; acus distinct, separate. *Anal Segment*: Hair 3-X single; ventral brush with 6 pairs of hairs.

DISCUSSION. The Quadrivittatus Group of 4 species is distinguished by unique features both in the adults (absence of midfemoral and hindfemoral light spots) and in the larvae (ventral brush with 6 pairs of hairs). Since both these characters are primitive ones in the subgenus, this group probably represents the most ancient lineage in the section.

The group is known only in Central America from southern Mexico to central Panama, usually at elevations above 4,000 feet, and is sympatric with the Allotecnon Group (fig.5). *A. quadrivittatus* is the only widespread species, occupying the entire known range of the group; *lorraineae* is restricted to the Sierra Madre del Sur and Sierra Madre de Chiapas in Mexico, where it is sympatric with *quadrivittatus; spinosus* and *brevis* are sympatric with *quadrivittatus* in the southern part of the range, *spinosus* in the mountains of Costa Rica and western Panama, and *brevis* apparently only in western Panama.

17. Aedes (Howardina) quadrivittatus (Coquillett)

Figs.5,8,36,37

1902.*Culex quadrivittatus* Coquillett, 1902:292. TYPE: Holotype ♀, Chacula (Huehuetenango), Guatemala, elev. 6600 ft, 13 June 1902, Gustav Eisen [USNM, 6560].

Aedes (Howardina) quadrivittatus of Bonne and Bonne-Wepster (1925:369); Carpenter, Galindo and Trapido (1952:163); Horsfall (1955:471); Trapido, Galindo and Carpenter (1955:530,537, 538); Vargas (1956:22); Trapido and Galindo (1957:122,125,130); Galindo (1964:34,56); Belkin, Schick and Heinemann (1965:28); Forattini (1965:401-403); Diaz Najera (1966b:63).

Aedes quadrivittatus of Dyar and Knab (1907:11); Theobald (1910:486); Picado (1913:353); Howard, Dyar and Knab (1917:852-853); Dyar (1918:73); Kumm, Komp and Ruiz (1940:400, 417); Arnett (1949:238); Galindo, Carpenter and Trapido (1955:163); Stone and Knight (1956:224); Blanton and Peyton (1958:31).

Aedes (Howardina) quadrivittatus in part of Dyar (1928:229-230); Edwards (1932:155); Lane (1939:100; 1953:40); Stone, Knight and Starcke (1959:174).

Culex quadrivittatus of Blanchard (1905:628); Theobald (1905:29; 1910:395).

FEMALE. Wing: 3.33 mm. Proboscis: 2.16 mm. Forefemur: 1.8 mm. Abdomen: about 3.06 mm. *Head*: Light decumbent scales golden on median stripe and short orbital line; sides and venter creamy. Erect scales on occiput dull golden. Palpus about 0.2 of proboscis, with a few white scales apically and mesally on segment 4. Basal flagellar segment with dark scales. *Thorax* (fig.8): Mesonotal light scales golden; outer dorsocentral line complete, only slightly expanded at fossa, merging with lateral marginal line at level of humeral bristles; lateral marginal line long, extending from humeral bristles to wingbase. Median scutellar lobe with broad dark scales laterally and narrow median golden scales from base to apex; lateral lobe with a few linear golden scales. Paratergite with pale golden linear scales. *Apn* with narrow anterior and broader posterior pale golden scales; *ppn* with only an upper patch of pale golden linear scales; *psp* patch pale golden, linear; *ssp* patch with creamy broad scales; other pleural patches white, scales broad with distribution as in the group. *Legs*: Forefemur and midfemur predominantly dark anteriorly except for a few basal creamy scales, proximal half of posterior surfaces creamy and distal dark; hindfemur creamy up to 0.67 on both sides, rest dark. Foretarsus with a few basal white scales on segments 1,2; midtarsus with short, often incomplete basal white rings on 1,2; hindtarsus with moderate white rings on 1-3; rest of tarsi dark. *Haltere*: Stem pale, knob with dark scales basally; fringe whitish. *Abdomen*: Sternites with broad, V-shaped basal creamy patch and rest dark; with a few apical creamy scales on II-V.

MALE. Wing: 3.42 mm. Proboscis: 2.43 mm. Forefemur: 1.98 mm. Essentially similar to female in color. Submedian dark area of head narrower than in female. Median scutellar lobe with larger number of golden scales.

MALE GENITALIA (fig.36). As figured; diagnostic characters as in the key. Ninth tergite lobe prominent, with about 3-5 strong bristles. Sidepiece length 3.0 of median width. Apical seta of claspette on a short basal tubercle, broader than long. Clasper about 0.6 of sidepiece, with 1,2 subapical hairs; spiniform short, about 0.25 of clasper. Aedeagus shorter than proctiger; dorsal sclerotization more or less deeply emarginate, producing distinct lateral apical lobes.

PUPA (fig.36). Abdomen: 3.56 mm. Trumpet: 0.51 mm; index about 5.3-5.5. Paddle: 0.81 mm. Readily separated from *brevis* by the elongate paddle with produced apex; from *spinosus* by hair 9-VIII usually at least 8-branched. Chaetotaxy as figured, hairs moderately to darkly pigmented. *Cephalothorax*: Mesonotum between trumpets moderately pigmented, lateral areas deeper; metanotum strongly pigmented; trumpet strongly contrasting. Hair 1(1, 1-3), 2(1, 1-2), 3(1), 4(2, 2-3), 5(2), 6(1), 7(2), 8(2, 1-3), 9(1), 10(6, 2-7), 11(1, 1-2), 12(1, 1-3). *Abdomen*: Tergite I strongly pigmented except for usual membranous areas; segments II-IV strongly pigmented and imbricate, rest progressively lighter caudad. Segment I: hair 1(8-13 primary branches, each with several secondary branches), 2(1, 1-6), 3(1), 4(2, 2-3), 5(2, 1-3), 6(1, 1-2), 7(1, 1-2), 9(1). Segment II: hair 0(1), 1(5, 2-10), 2(1, 1-3), 3(1), 4(3, 2-5), 5(1, 1-2), 6(1), 7(1, 1-2), 9(1). Segment III: hair 0(1), 1(1, 1-3), 2(1, 1-2), 3(1), 4(1, 1-2), 5(1, 1-2), 6(1), 7(2, 1-3), 8(2, 1-3), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(1, 1-2), 2(1, 1-2), 3(2), 4(1, 1-2), 5(2), 6(1), 7(1, 1-3), 8(2, 1-3), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1, 1-2), 5(2, 1-2), 6(1), 7(2, 2-4), 8(2, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1, 1-2), 6(1, 1-3), 7(1, 1-2), 8(2, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1, 1-2), 4(1), 5(1), 6(1, 1-2), 7(1), 8(1, 1-2), 9(4, 3-6), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(9, 7-11), 14(1, 1-2). *Paddle*: Moderately to deeply pigmented, midrib darker; apex distinctly produced; external margin serrate; hair 1 slender. Male genital lobe extending to 0.4 of paddle, female genital lobe to 0.31.

LARVA (fig.37). Head: 0.86 mm. Siphon: 0.97 mm. Anal Saddle: 0.27 mm. Readily separated from *spinosus* and *brevis* by the siphon without distinct spicules and hair 12-C double; from *lorraineae* by hair 5-C usually 5-branched. Chaetotaxy as figured, hairs moderately to darkly pigmented. *Head*: Width subequal to length; pigmentation moderate except around mouthparts where it is deeper. Mental plate with a strong median tooth and 11 distinct teeth (11-12) on each side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(8, 8-11), 5(6, 5-7), 6(7, 5-10), 7(9, 8-15), 8(1), 9(5, 4-6), 10(2), 11(12, 10-17), 12(2, 2-4), 13(1), 14(12, 11-17), 15(3, 2-3). *Antenna*: Length about 0.45 of head; pigmentation moderate. All hairs single except 1-A which is branched (3, 2-3), and at 0.5 from base. *Thorax*: Integument with simple or branched hairlike spicules. Stellate hairs with many barbed branches; long hairs barbed and with attenuate apices. Prothorax: hair 0(19, 13-26), 1(5, 5-8), 2(1), 3(9, 8-11), 4(3, 3-4), 5(2, 1-3), 6(1), 7(2), 8(16, 16-20), 9(9, 7-10), 10(1), 11(2, 1-3), 12(1), 13(24, 20-27), 14(38, 38-48). Mesothorax: hair 1(11, 10-16), 2(1), 3(1), 4(1), 5(1), 6(6, 5-6), 7(1), 8(8, 6-9), 9(9, 7-10), 10(1), 11(1), 12(1), 13(6, 3-8), 14(8, 7-12). Metathorax: hair 1(14, 11-18), 2(1), 3(4, 3-7), 4(15, 12-20), 5(15, 13-20), 6(1), 7(8, 7-10), 8(7, 4-8), 9(5, 5-7), 10(1), 11(1), 12(1), 13(17, 16-23). *Abdomen*: Integument and stellate hairs as on thorax. Segment I: hair 1(21, 16-25), 2(21, 19-28), 3(1), 4(1), 5(14, 14-19), 6(3, 3-4), 7(1), 9(4, 3-6), 10(1), 11(18, 16-24), 13(10, 8-17). Segment II: hair 0(1), 1(18, 17-22), 2(22, 17-28), 3(1), 4(1), 5(18, 16-21), 6(3, 3-5), 7(8, 7-9), 8(1), 9(6, 5-8), 10(1), 11(1), 12(1), 13(14, 12-19). Segment III: hair 0(1), 1(21, 18-25), 2(18, 16-26), 3(1), 4(1), 5(21, 16-26), 6(1), 7(10, 8-11), 8(1), 9(12, 7-15), 10(1), 11(1), 12(1), 13(20, 17-21), 14(1). Segment IV: hair 0(1), 1(20, 18-27), 2(17, 16-27), 3(1), 4(1), 5(21, 15-24), 6(1), 7(8, 8-10), 8(1), 9(16, 10-16), 10(1), 11(1), 12(1), 13(20, 15-21), 14(1). Segment V: hair 0(1), 1(21, 19-27), 2(16, 16-22), 3(1), 4(1), 5(20, 14-20), 6(1), 7(9, 8-12), 8(1), 9(16, 11-19), 10(1), 11(1), 12(1), 13(18, 14-20), 14(1). Segment VI: hair 0(1), 1(17, 17-23), 2(18, 14-21), 3(1), 4(1), 5(17, 15-19), 6(1), 7(9, 8-13), 8(1), 9(15, 10-16), 10(1), 11(1), 12(1), 13(15, 11-15), 14(1). Segment VII: hair 0(1), 1(18, 16-21), 2(16, 14-19), 3(1), 4(1), 5(16, 9-19), 6(6, 4-7), 7(2, 2-3), 8(2, 1-3), 9(9, 8-14), 10(1), 11(1), 12(1), 13(4, 3-5), 14(1). *Segment VIII:* Comb scales 16(14-20), deeply pigmented, elongate; lateral fringes not extending to apex. Hair 0(1), 1(11, 9-14), 2(1), 3(8, 6-10), 4(1), 5(5, 5-6), 14(1). *Siphon*: Index about 4.0-4.2; integument imbricate, moderately to deeply pigmented, with darker basal ring. Pecten with 17(13-18) teeth extending to 0.4 and terminating before hair 1-S; individual tooth long, pointed, with basal denticles. Hair 1(3, 3-4), 2(1), 3-5 not visible, 6(1), 7(1), 8(2, 1-2), 9(1). *Anal Segment*: Saddle deeply pigmented and imbricate; caudal margin with spines of varying length, long ones predominating. Gills long, subequal, as long as ventral brush. Hair 1(2), 2(5, 4-5), 3(1), 4a(4, 3-4), 4b(3, 2-3), 4c(3, 2-4), 4d(3, 2-4), 4e(3, 3-4), 4f(3, 2-4).

SYSTEMATICS. *A. quadrivittatus* is the only species occupying the entire range of the Quadrivittatus Group from the southern end of the Sierra Madre Oriental in Mexico to central Panama. I have seen no specimen of *quadrivittatus* from eastern Panama and all material from South America, formerly reported as this species, actually belongs to new species in the Eleanorae Group. *A. quadrivittatus* is readily differentiated in all stages from the 3 other members of the group which have restricted distributions, all peripherally sympatric with *quadrivittatus*. Its closest relative is undoubtedly *lorraineae* (see). Very little variation is apparent throughout the wide known distribution of *quadrivittatus* except at the northern end in Mexico where the light thoracic scaling of the adults tends to be more yellowish or creamy. No significant population differentiation in the immature stages has been detected in the relatively large sample examined.

BIONOMICS. *A. quadrivittatus* apparently breeds only in epiphytic bromeliads, primarily in cloud forest areas at elevations above 4,000 feet. Females are readily attracted to human bait and display a distinct preference for feeding in the forest canopy (Carpenter, Galindo and Trapido 1952:163). Recently an unidentified arbovirus has been isolated from *quadrivittatus* in Panama (Galindo 1964:34).

DISTRIBUTION (fig.5). Cordilleras of Middle America in Mexico (southern part of Sierra Madre Oriental and eastern end of Sierra Madre del Sur), Guatemala, Honduras, El Salvador, probably Nicaragua, Costa Rica and Panama (western part) at elevations varying from about 4000 ft to 8400 ft. Material examined: 321 specimens; 15 ♂, 42 ♀, 43 pupae, 221 larvae; 31 individual rearings (6 pupal, 13 larval, 12 incomplete).

COSTA RICA. *Alajuela*: Poasito, 14 Nov 1962, C.L. Hogue and W.A. Powder (CR 23), 1 lp♀ (23-105), 1 L [UCLA]. Volcan Poas, 1 p♀ (156), 1 ♀ [USNM]; Summit, 9 July 1963, C.L. Hogue, 1 L (CR 145) [UCLA]. *Cartago*: Elev. 1500 m, C. Picado, 2 ♀ [USNM]. Cervantes, 9 Nov 1962, J.N. Belkin, C.L. Hogue and W.A. Powder, 3 L (CR 13) [UCLA]. Cipreses, 4 ♂, 2 ♀, 9 L, 31 [USNM]. La Sierra, elev. 6300-8400 ft, 24 Nov 1962, C.L. Hogue and W.A. Powder, 1 lP (49-107), 1 ♂, 7 L (CR 49), 1 lp♂ (51-105), 1 lp♀ (51-103), 2 lP (51-107,110), 2 ♂, 6 P, 1 p, 25 L (CR 51), 1 lp♂ (52-105), 2 lP (52-106,108), 12 L (CR 52), 3 lp♂ (53-101-103), 1 P, 2 L (CR 53), 1 lp♂ (54-103), 1 lp♀ (54-106), 5 lP (54-101,102,104,105,107), 3 P, 1 p, 117 L (CR 54) [UCLA].

EL SALVADOR. Los Esesmiles, H.W. Kumm, 2 L [USNM].

GUATEMALA. *Chimaltenango*: San Andres Semetabaj, 17 July 1965, Cowsill (GUA 50), 1 lp♀ (50-10) [UCLA]. Solola, 30 June 1964, J.N. Belkin and J.E. Zavortink (GUA 15), 2 lp♂ (15-10, 12), 1 lp♀ (15-11), 2 lP (15-13,14), 3 L [UCLA]. *Huehuetenango*: Chacula, elev. 6600 ft, 13 June 1902, G. Eisen, type series, 6 ♀ [USNM]. *Locality not specified*: Sept 1902, G. Eisen, 1 ♀; 1 ♂, 3 ♀ [USNM].

HONDURAS. Tegucigalpa, 17 July 1945, 1 lp [USNM].

MEXICO, *Chiapas*: Paval, 28 A (Diaz Najera 1966b:61). Teopisca, 19 Aug 1964, E. Fisher and D. Verity, 10 L (MEX 132) [UCLA]. Triunfo, 125 A (Diaz Najera 1966b:61). *Morelos*: (Vargas 1956:22). *Oaxaca*: Ixtlan de Juarez, Vivero Rancho Teja, elev. 7200 ft, 12 Aug 1966, D.A. Schroeder (MEX 430), 1 p♂ (430-105), 4 p♀ (430-101-104), 12 ♀ (MEX 433) [UCLA]. *Tamaulipas*: Rancho del Cielo, 4 Apr 1963, Trevino, 2 ♀ [USNM]. *Veracruz*: Banderilla, Feb 1945, G. Lissmann, 2 ♂ [UCLA].

PANAMA. *Bocas del Toro*: near Almirante, 1952-53, 2297 ♀ (Trapido and Galindo 1957:122, 125). La Zorra, elev. 4400 ft, 5 Apr 1963, A. Quinonez, 2 ♀ (PA 174), 1 ♀ (PA 175) [UCLA]. *Panama*: Cerro Campana, 28 Aug 1963, A. Quinonez, 1 ♀ (PA 537) [UCLA].

18. Aedes (Howardina) lorraineae Berlin, n.sp.

Figs.5,8,38

TYPES: Holotype ♀ (MEX 433), Vivero Rancho Teja, Ixtlan de Juarez, Oaxaca, Mexico, 7200 ft, biting collection, 12 Aug 1966, D.A. Schroeder [USNM]. Paratypes: 7 ♀ (MEX 433), same data as holotype [USNM, BM, UCLA]. This species is dedicated to the memory of Mrs. Lorraine Belkin.

FEMALE. Wing: 3.85 mm. Proboscis: 2.62 mm. Forefemur: 2.19 mm. Abdomen: about 3.15 mm. Generally similar to *quadrivittatus* and other members of the group, differing primarily in the following. *Head*: Light decumbent scales on median stripe and short orbital line creamy. Erect scales creamy. Palpus about 0.2 of proboscis, with a few white scales on mesal surface of segment 4. Basal flagellar segment with a few white scales on dorsomesal surface. *Thorax* (fig.8): Mesonotal light lines creamy to pale golden; outer dorsocentral line complete, broadly joined anteriorly in fossa to entire lateral prescutal area and reaching to scutellum; lateral marginal line shorter, extending from scutal angle to wingbase. Narrow light scales on median scutellar lobe creamy; lateral lobes with a few narrow creamy scales. Paratergite and *psp* with moderately broad, white scales; *apn* patch creamy; upper *ppn* with predominantly broad creamy scales; lower *ppn* white, adjoining *ssp* patch; other pleural patches white, distributed as in the group. *Legs*: Forefemur and midfemur predominantly dark anteriorly except for scattered creamy scales up to proximal 0.5, proximal 0.5 of posterior surfaces creamy, extending distally as narrow line, rest dark; hindfemur creamy proximally to 0.6 on both sides and rest dark. Foretarsus with basal white scales on segment 1; midtarsus with short incomplete white rings on 1,2; hindtarsus with moderately broad white rings on 1-3. *Haltere*: Stem pale, knob predominantly white, with a few basal dark scales. *Abdomen*: Sternites with broad V-shaped basal white patches; apical white scales numerous on II-IV, few on V and absent on distal segments.

MALE unknown and PUPA imperfectly known.

LARVA (fig.38). Head: 0.81 mm. Siphon: 0.87 mm. Anal Saddle: 0.27 mm. Diagnostic characters as in the key. Readily separated from *quadrivittatus* by hair 5-C usually only 3,4-branched; from *brevis* and *spinosus* by the absence of spicules on siphon. *Head*: Mental plate with a strong median tooth and 11 distinct teeth (10-12) on each side, often a small detached tooth at base. Hair 0(1), 1(1), 3(1), 4(7, 5-11), 5(3, 3-4), 6(5, 5-6), 7(6, 6-9), 8(1), 9(2, 1-3), 10(2), 11(11, 9-17), 12(2, 1-2), 13(1), 14(8, 6-13), 15(2, 2-3). *Antenna*: Length about 0.33 of head; uniformly moderately pigmented, with a few scattered spicules; hairs simple except 1(2, 2-3). *Thorax*: Integument predominantly with simple hairlike spicules. Stellate hairs with many unequal barbed branches; long hairs barbed and with attenuate apices. Prothorax: hair 0(16, 13-17), 1(6, 4-6), 2(1), 3(8, 6-10), 4(4, 2-4), 5(2), 6(1), 7(2), 8(16, 14-19), 9(8, 7-9), 10(1), 11(2, 1-2), 12(1), 13(22, 19-27), 14(40, 38-56). Mesothorax: hair 1(11, 10-18), 2(1), 3(1), 4(1), 5(1), 6(6, 4-6), 7(1), 8(7, 6-8), 9(6, 6-9), 10(1), 11(1, 1-2), 12(1), 13(6, 5-9), 14(7, 6-9). Metathorax: hair 1(13, 10-18), 2(1), 3(4, 4-6), 4(10, 10-17), 5(13, 8-16), 6(1), 7(7, 4-8), 8(6, 6-9), 9(5, 4-7), 10(1), 11(1, 1-2), 12(1), 13(20, 14-22). *Abdomen*: Long and stellate hairs as in thorax. Segment I: hair 1(18, 15-21), 2(16, 14-22), 3(1), 4(1), 5(12, 10-16), 6(3, 2-3), 7(1), 9(5, 4-7), 10(1), 11(17, 14-21), 13(15, 9-21). Segment II: hair 0(1), 1(17, 13-20), 2(20, 12-23), 3(1), 4(1, 1-2), 5(16, 13-19), 6(3), 7(8, 5-10), 8(1), 9(6, 6-9), 10(1), 11(1), 12(1), 13(14, 11-17). Segment III: hair 0(1), 1(20, 15-22), 2(16, 14-21), 3(1), 4(1), 5(16, 13-20), 6(1, 1-2), 7(10, 8-11), 8(1), 9(10, 8-16), 10(1), 11(1), 12(1), 13(16, 16-19), 14(1). Segment IV: hair 0(1), 1(20, 15-23), 2(19, 15-19), 3(1), 4(1), 5(16, 14-22), 6(1, 1-2), 7(10, 7-12), 8(1), 9(12, 10-18), 10(1), 11(1), 12(1), 13(17, 13-21), 14(1). Segment V: hair 0(1), 1(19, 14-21), 2(18, 12-18), 3(1), 4(1), 5(16, 11-17), 6(1, 1-2), 7(11, 8-11), 8(1), 9(12, 10-17), 10(1), 11(1), 12(1), 13(15, 12-19), 14(1). Segment VI: hair

0(1), 1(18, 12-23), 2(17, 12-18), 3(1), 4(1), 5(16, 12-17), 6(1, 1-2), 7(10, 8-12), 8(1), 9(13, 8-18), 10(1), 11(1), 12(1), 13(12, 10-19), 14(1). Segment VII: hair 0(1), 1(18, 13-23), 2(17, 10-18), 3(1), 4(1), 5(16, 13-20), 6(4, 3-5), 7(2, 2-3), 8(2, 2-4), 9(8, 6-11), 10(1), 11(1), 12(1), 13(4, 3-4), 14(1). *Segment VIII*: Comb scales usually 16(14-20), moderately pigmented, their lateral fringes not extending to apex. Hair 0(1), 1(8, 7-16), 2(1), 3(8, 7-9), 4(1), 5(6, 5-8), 14(1, 1-2). *Siphon*: Index 3.3-3.6; integument imbricate, moderately pigmented, with darker basal ring. Pecten teeth usually 16(13-18), extending to 0.4. Hair 1(4, 3-5), 2(1), 3-5 not visible, 6(1), 7(1), 8(2, 1-2), 9(1). *Anal Segment*: Saddle moderately pigmented. Gills subequal, narrow, as long as ventral brush. Hair 1(2, 2-3), 2(5, 4-6), 3(1), 4a(3, 3-4), 4b(3, 2-3), 4c(3, 2-3), 4d(3, 2-3), 4e(3, 2-3), 4f(3, 2-3).

SYSTEMATICS. *A. lorraineae* is undoubtedly closely related to *quadrivittatus*. It is differentiated in the female most conspicuously by the white scales on the first flagellar segment and generally whiter scales on the mesonotum and pleura. The association of the immature stages with the females is presumptive only since all the rearings are incomplete. The larva described here, although very similar to *quadrivittatus*, is distinct from those of Mexican and other populations of the latter in the smaller number of branches in head hair 5. The pupal stage is also in general similar to *quadrivittatus* but cannot be described at this time since only a few imperfect whole pupae from incomplete rearings are available. *A. lorraineae* is known at present only from the Sierra Madre del Sur and the Sierra Madre de Chiapas in Mexico at elevations above 7,000 feet. In the eastern part of this range, in the states of Oaxaca and Chiapas, *lorraineae* is sympatric with *quadrivittatus*. In one biting-landing collection (MEX 433) in Oaxaca where the 2 species were taken in approximately equal numbers there is no indication of intergradation between *lorraineae* and *quadrivittatus*. This supports my interpretation that *lorraineae* is a distinct species and not a geographical isolate of *quadrivittatus*.

BIONOMICS. Immature stages of *lorraineae* have been collected in epiphytic bromeliads only. Females of this species are apparently readily attracted to humans.

DISTRIBUTION (fig.5). Sierra Madre del Sur and Sierra Madre de Chiapas in Mexico at elevations above 7000 ft. Material examined: 75 specimens; 11 ♀, 5 pupae, 59 larvae; 5 incomplete individual rearings.

MEXICO. *Chiapas*: 27 Mar 1961, R.B. Eads, 1 L [USNM]. *Guerrero*: Omilteme, 8 Sept 1965, D.A. Schroeder, 3 ♀ (MEX 361A), 3 lP (362-21-23), 24 L (MEX 362) [UCLA]. *Oaxaca*: Ixtlan de Juarez, El Punto, elev. 7700 ft, 13 Aug 1966, D.A. Schroeder, 4 L (MEX 434); Vivero Rancho Teja, elev. 7200 ft, 12 Aug 1966, D.A. Schroeder, 2 lP (428-10,11), 9 L (MEX 428), 4 L (MEX 429), 9 L (MEX 430), 3 L (MEX 431), 8 ♀ (MEX 433, type series) [USNM, BM, UCLA].

19. Aedes (Howardina) brevis Berlin, n.sp.

Figs.5,9,39,40

TYPES: Holotype ♂ (PA 171-104) with associated pupal skin and genitalia slide, La Zorra, Chiriquisito, Chiriqui Grande, Bocas del Toro, Panama, 4400 ft, 5 Apr 1963, A. Quinonez [USNM]. Allotype ♀ (PA 171-102) with associated pupal skin, same data as holotype [USNM]. Paratypes: 1 l♀ (171-105), 2 lP (171-101,103), 2 P, 18 L, same data as holotype [UCLA].

FEMALE. Wing: 3.78 mm. Proboscis: 2.7 mm. Forefemur: 2.34 mm. Abdomen: about 3.1 mm. Generally similar to *quadrivittatus* and other members of the group; differing primarily in the following. *Head*: Palpus about 0.15 of proboscis; with distinct apical white scales on segment 4. *Thorax* (fig.9): Outer dorsocentral line incomplete, arising at anterior 0.33 and reaching to scutellum; lateral marginal line long, extending from anterior promontory to wingbase, slightly curved inwards at lateral prescutal area. Lateral scutellar lobes with a few narrow dark scales. Paratergite and *psp* with narrow creamy scales; other pleural scale patches as in *quadrivittatus*, all dull white. *Legs*: Forefemur dark anteriorly except for a few basal dingy scales, proximal 0.5 of posterior surface dingy white, extending distally as narrow line bordered by dark scales; midfemur dark anteriorly, proximal 0.6 of posterior surface dingy white, distal dark; hindfemur dingy white proximally to 0.67 on both sides, rest dark. Foretarsus with basal white scales on segments 1,2; midtarsus with short incomplete white rings on 1,2; hindtarsus with broader white rings on 1-3, last covering about 0.65 of segment. *Haltere*: Stem pale; knob predominantly white, with a few dorsal dark scales. *Abdomen*: Sternites with broad V-shaped basal creamy patches; apical light scales apparent on II,III.

MALE. Wing: 3.33 mm. Proboscis: 2.89 mm. Forefemur: 2.28 mm. Essentially similar to the female in color.

MALE GENITALIA (fig.39). As figured; diagnostic characters as in the key. Ninth tergite lobe indistinct, with 8-10 moderate bristles. Sidepiece length about 3.0 of median width. Clasper about 0.5 of sidepiece, with 1,2 subapical hairs; spiniform short, length about 0.25 of clasper. Apex of aedeagus with slender horns bent dorsad.

PUPA (fig.39). Abdomen: 3.78 mm. Trumpet: 0.54 mm; index about 6.0. Paddle: 0.7 mm. Readily separated from other species of group by the deeply emarginate paddle. Chaetotaxy as given below, hairs moderately to darkly pigmented. *Cephalothorax*: Mesonotum lightly pigmented between trumpets, lateral areas darker; metanotum moderately pigmented. Hair 1(1, 1-2), 2(1), 3(1), 4(2), 5(2), 6(1), 7(2, 1-2), 8(2, 2-3), 9(1), 10(12, 12-14), 11(1), 12(1, 1-3). *Abdomen*: Tergite I uniformly moderately pigmented except for usual membranous areas; other segments moderate, pigmentation progressively lighter caudad. Segment I: hair 1(10-20 primary branches, each with secondary branches), 2(2, 1-4), 3(1), 4(3, 2-4), 5(3, 2-5), 6(1), 7(1, 1-2), 9(1); in some hair 10(1) present. Segment II: hair 0(1), 1(16, 12-20), 2(1, 1-2), 3(1), 4(3, 1-3), 5(2, 1-3), 6(1), 7(1), 9(1), 11(1). Segment III: hair 0(1), 1(2, 2-3), 2(1), 3(1), 4(1, 1-2), 5(1, 1-5), 6(1), 7(1, 1-2), 8(1), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(2), 2(1), 3(2, 1-2), 4(1), 5(2), 6(1), 7(1), 8(1), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(2, 1-2), 2(1), 3(1), 4(1), 5(2), 6(1), 7(2, 1-3), 8(1), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1), 5(1), 6(1), 7(2, 1-6), 8(1), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1), 5(1), 6(2, 1-3), 7(1), 8(1, 1-2), 9(7, 5-8), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(11, 11-14), 14(1). *Paddle*: Uniformly lightly pigmented, midrib slightly darker; deeply emarginate; external margin serrate; hair 1-P single. Male genital lobe extending to about 0.5 of saddle, female genital lobe to 0.35.

LARVA (fig.40). Head: 0.96 mm. Siphon: 0.6 mm. Anal Saddle: 0.3 mm. Readily separated from other members of the group by hair 5-C usually with 18 branches (11-22) and short siphon with an index of about 2.0. *Head*: Mental plate with a strong median tooth and 10 distinct teeth (9-10) on each side, often a small detached tooth at base. Hair 0(1), 1(1), 3(1), 4(16, 13-20), 5(18, 11-22), 6(12, 9-19), 7(15, 11-21), 8(4, 1-7), 9(9, 6-18), 10(6, 3-8), 11(24, 18-25), 12(8, 5-12), 13(1), 14(19, 15-22). 15(2, 2-4). *Antenna*: Length about 0.35 of head; shaft uniformly moderately pigmented, with a few scattered spicules; hairs simple except 1(2, 2-3). *Thorax*: Integument with simple and branched, hairlike spicules. Stellate hairs with many unequal barbed branches; long hairs barbed and with attenuate apices. Prothorax: hair

0(24, 19-24), 1(12, 10-14), 2(1, 1-2), 3(14, 13-23), 4(4, 3-6), 5(2, 2-3), 6(1), 7(3, 2-3), 8(21, 16-26), 9(7, 6-12), 10(1), 11(2, 1-2), 12(1), 13(30, 24-31), 14(38, 34-43). Mesothorax: hair 1(21, 15-33), 2(1), 3(1), 4(1), 5(1, 1-2), 6(6, 6-9), 7(1), 8(7, 5-7), 9(9, 7-10), 10(1), 11(1, 1-2), 12(1), 13(16, 9-16), 14(16, 15-21). Metathorax: hair 1(28, 22-30), 2(1), 3(16, 12-19), 4(5, 4-5), 5(12, 11-15), 6(1), 7(6, 4-9), 8(14, 10-18), 9(5, 5-8), 10(1), 11(1), 12(1), 13(19, 19-35). *Abdomen*: Stellate hairs as in thorax. Segment I: hair 1(29, 29-32), 2(22, 18-31), 3(1), 4(1, 1-3), 5(18, 14-23), 6(3, 1-4), 7(1), 9(7, 5-8), 10(1), 11(22, 17-22), 13(26, 23-27). Segment II: hair 0(1), 1(26, 24-40), 2(22, 15-26), 3(1), 4(1), 5(18, 16-23), 6(3, 3-4), 7(13, 5-14), 8(1), 9(13, 9-15), 10(1), 11(1), 12(1), 13(25, 21-26). Segment III: hair 0(1), 1(26, 24-35), 2(18, 15-22), 3(1), 4(1), 5(18, 17-22), 6(3, 2-3), 7(14, 11-15), 8(1), 9(16, 12-16), 10(1), 11(1), 12(1), 13(21, 19-25), 14(1). Segment IV: hair 0(1), 1(26, 24-29), 2(16, 16-20), 3(1), 4(1), 5(19, 15-21), 6(2), 7(11, 11-18), 8(1), 9(15, 15-18), 10(1), 11(1), 12(1), 13(21, 20-34), 14(1). Segment V: hair 0(1), 1(25, 24-37), 2(18, 15-20), 3(1), 4(1), 5(18, 16-21), 6(2, 2-3), 7(12, 9-18), 8(1), 9(16, 14-24), 10(1), 11(1), 12(1), 13(19, 18-34), 14(1). Segment VI: hair 0(1), 1(27, 24-38), 2(18, 15-19), 3(1), 4(1), 5(16, 14-20), 6(2), 7(12, 11-14), 8(1), 9(16, 14-20), 10(1), 11(1), 12(1), 13(20, 17-22), 14(1). Segment VII: hair 0(1), 1(25, 23-30), 2(17, 14-22), 3(1), 4(1), 5(16, 14-18), 6(7, 5-7), 7(2, 1-2), 8(3, 2-4), 9(19, 14-20), 10(1), 11(1), 12(1), 13(19, 17-23), 14(1, 1-2). *Segment VIII*: Comb scales usually 16(14-17), moderately pigmented, their lateral fringes not extending to apex. Hair 0(1), 1(18, 15-21), 2(1), 3(7, 6-9), 4(1), 5(16, 15-20), 14(1). *Siphon*: Index about 2.0; integument moderately pigmented, with darker basal ring and with rows of small hairlike spicules. Pecten teeth usually 9(7-16), extending to 0.3. Hair 1(5, 4-6), 2(1), 3-5 not visible, 6(1), 7(1), 8(1, 1-2), 9(1). *Anal Segment*: Saddle moderately pigmented, with a darker basal ring and with small spicules; caudal margin with spines of varying length. Gills about 2.0 of saddle length, narrow and subequal. Hair 1(2, 2-3), 2(6, 4-6), 3(1), 4a(4, 3-5), 4b(3, 2-3), 4c(3, 3-4), 4d(4), 4e(4, 3-5), 4f(4, 3-5).

SYSTEMATICS. The adults of *brevis* cannot be differentiated from the apparently closely related *spinosus* but the immature stages of the 2 species are strikingly differentiated as indicated in the diagnosis and in the keys. The association of all the stages is undoubtedly correct although no complete larval rearings were made. At present, *brevis* is known only from northern Panama where it has been found in the same locality as *quadrivittatus* and *spinosus* but not in the same collections.

BIONOMICS. Immature stages of *brevis* have been collected in epiphytic bromeliads at elevations above 4,000 feet. All 5 known adults were reared but it is possible that the 2 females taken in biting-landing collections in Panama provisionally identified as *spinosus* are actually *brevis*.

DISTRIBUTION (fig.5). Chiriqui mountains of Panama at elevations above 4000 ft. Material examined: 58 specimens; 3 ♂, 2 ♀, 10 pupae, 43 larvae; 8 individual rearings (1 larval, 4 pupal, 3 incomplete).

PANAMA. *Bocas del Toro*: La Zorra, elev. 4400 ft, 5 Apr 1963, A. Quinonez (PA 171, type series), 1 l♂ (171-105), 1 p♂ (171-104), 1 p♀ (171-102), 2 lP (171-101,103), 2 P, 18 L; 6 Apr 1963, A. Quinonez, 18 L (PA 178); 9 Apr 1963, A. Quinonez (PA 183), 1 p♂ (183-101), 1 p♀ (183-103), 1 lP (183-102), 3 L [USNM, UCLA].

20. Aedes (Howardina) spinosus Berlin, n.sp.

Figs.5,9,41,42

TYPES: Holotype ♀ (CR 13-111) with associated pupal and larval skins, near Cervantes, Cartago, Costa Rica, 9 Nov 1962, J.N. Belkin, C.L. Hogue and W.A. Powder [USNM]. Paratypes: 4 larvae (CR 13), same data as holotype [USNM, UCLA].

FEMALE. Wing: 3.33 mm. Proboscis: 2.32 mm. Forefemur: 1.8 mm. Abdomen: 3.06 mm. Holotype lacking part of hindtarsus, entire left leg and abdomen. Essentially similar to *brevis* in all details, from which it cannot be separated. The only apparent difference is in the pleural scales which are white in *spinosus* and dingy white in *brevis* (fig.9).

MALE. Wing: 3.5 mm. Proboscis: 2.8 mm. Forefemur: 2.15 mm. Essentially similar to female in color.

MALE GENITALIA (fig.41). Diagnostic characters as in the key. Essentially similar to *brevis* in all details.

PUPA (fig.41). Abdomen: 3.25 mm. Trumpet: 0.5 mm; index about 6.0. Paddle: 0.77 mm. Readily separated from *brevis* by the rounded or slightly produced paddle; from *quadrivittatus* by 2-branched hair 9-VII and 5-branched 9-VIII. Hairs moderately to darkly pigmented. *Cephalothorax*: Mesonotum lightly pigmented between trumpets, lateral areas and metanotum slightly darker; trumpets moderately long, strongly contrasting. Hair 10-C with 5 branches; 12-C double. *Abdomen*: Tergite I moderately pigmented except for usual membranous areas; pigmentation of rest of segments moderate, progressively lighter caudad. Hair 1-II 8-branched; hair 5-IV,V long, double, exceeding apex of second tergite following; hair 9-VII distinctly larger than 6-VII, double, long, exceeding apex of tergite; hair 9-VIII long, 5-branched. *Paddle*: Uniformly lightly pigmented, midrib slightly darker; apex rounded or slightly produced; hair 1-P single; external margin serrate. Female genital lobe extending to 0.38 of paddle.

LARVA (fig.42). Head: 0.88 mm. Siphon: 0.88 mm. Anal Saddle: 0.33 mm. Readily separated from *quadrivittatus* and *lorraineae* by the pilose siphon; from *brevis* by the longer siphon and hair 5-C usually 5-branched (4-7). *Head*: Mental plate with a strong median tooth and 11 distinct teeth (11-12) on each side, often a small detached tooth at base. Hair 0(1), 1(1), 3(1), 4(9, 8-11), 5(5, 4-7), 6(8, 6-9), 7(8, 8-11), 8(2, 1-3), 9(7, 5-9), 10(4, 3-5), 11(21, 17-24), 12(8, 4-10), 13(1), 14(16, 15-24), 15(3). *Antenna*: Length about 0.33 of head; shaft moderately pigmented and with a few scattered spicules; hairs simple except 1(2, 2-3) which is at about 0.6 from base. *Thorax*: Integument predominantly with branched, hairlike spicules. Stellate hairs with many unequal barbed branches; long hairs with attenuate apices. Prothorax: hair 0(18, 16-20), 1(5, 5-8), 2(1), 3(11, 10-14), 4(3, 3-5), 5(2), 6(1), 7(2), 8(16, 16-20), 9(6, 4-7), 10(1), 11(2, 2-3), 12(1), 13(31, 20-38), 14(44, 44-60). Mesothorax: hair 1(18, 9-20), 2(1), 3(1), 4(1), 5(1), 6(6, 4-6), 7(1), 8(7, 6-7), 9(7, 4-7), 10(1), 11(2), 12(1), 13(5, 4-7), 14(8, 5-14). Metathorax: hair 1(25, 14-27), 2(1), 3(4, 3-4), 4(18, 14-20), 5(18, 15-20), 6(1), 7(7, 5-8), 8(10, 5-10), 9(5, 4-6), 10(1), 11(1, 1-2), 12(1), 13(20, 18-24). *Abdomen*: Segment I: hair 1(28, 24-33), 2(25, 22-27), 3(1), 4(1), 5(20, 16-23), 6(3), 7(1, 1-2), 9(6, 6-8), 10(1), 11(22, 19-25), 13(24, 20-28). Segment II: hair 0(1), 1(30, 26-34), 2(24, 21-28), 3(1), 4(1), 5(28, 22-31), 6(3), 7(14, 10-14), 8(1), 9(14, 11-16), 10(1), 11(1), 12(1), 13(29, 26-31). Segment III: hair 0(1), 1(30, 22-35), 2(25, 22-29), 3(1), 4(1), 5(28, 22-31), 6(2), 7(16, 10-16), 8(1), 9(20, 11-22), 10(1), 11(1), 12(1), 13(28, 18-32), 14(1). Segment IV: hair 0(1), 1(30, 21-36), 2(27, 20-28), 3(1), 4(1), 5(26, 19-31), 6(2), 7(16, 9-17), 8(1), 9(20, 15-25), 10(1), 11(1), 12(1), 13(27, 20-32), 14(1). Segment V: hair 0(1), 1(34, 23-34), 2(24, 16-28), 3(1), 4(1), 5(26, 20-31), 6(2), 7(16, 9-19), 8(1), 9(21, 16-24), 10(1), 11(1), 12(1), 13(27, 18-28), 14(1). Segment VI: hair 0(1), 1(32, 21-33), 2(23, 17-27), 3(1), 4(1), 5(27, 19-29), 6(2), 7(17, 11-20), 8(1), 9(20, 15-24), 10(1), 11(1), 12(1), 13(20, 16-24), 14(1). Segment VII: hair 0(1), 1(30, 22-34), 2(25, 17-26), 3(1), 4(1), 5(18, 17-24), 6(9, 6-11), 7(2, 2-3), 8(1), 9(22, 10-23), 10(1), 11(1), 12(1), 13(17, 13-20), 14(1). *Segment VIII*: Comb scales usually 16(14-18), moderately pigmented; individual scale long, pointed apically and fringed nearly to tip. Hair 0(1), 1(22, 14-26), 2(1), 3(8, 7-9), 4(1), 5(12, 8-16), 14(1). *Siphon*: Index about 3.2-4.0; moderately pigmented, except for dark basal ring; uniformly covered with rows of small hairlike spicules. Pecten teeth usually 10(10-15), extending to about 0.4 before hair 1-S; individual tooth long, pointed, with basal denticles. Hair 1(5, 4-5), 2(1), 3-5 not visible, 6(1), 7(1), 8(2), 9(1). *Anal Segment*: Saddle moderately pigmented except for darker basal ring; covered with small spicules; caudal margin with serrated spines of varying length. Gills long, subequal, as long as ventral brush. Hair 1(2), 2(6, 6-7), 3(1), 4a(5, 4-5), 4b(3, 3-4), 4c(3, 3-4), 4d(4, 3-4), 4e(3, 3-4), 4f(3, 1-3).

SYSTEMATICS. *A. spinosus* is recognized as a distinct species entirely on the basis of striking and constant features of the immature stages as indicated in the diagnosis. The single individually reared adult (♀) shows no obvious differences from the 5 individually reared specimens of *brevis*. Therefore, the identity of the male and the 5 females listed below is questionable; they could possibly be *brevis. A. spinosus* is known at present only from areas of cloud forest above 4,000 feet in Costa Rica and Panama. It is sympatric throughout this range with the dominant *quadrivittatus*. Although the 2 species are reported as being associated in 2 collections of immature stages in Costa Rica (CR 13,54), it is not known if they were actually found together in the same bromeliads. In Panama, *spinosus* has been collected in the same locality as *brevis* but in this instance the immature stages were not associated in a given collection, suggesting an ecological barrier between the 2 species.

BIONOMICS. Immature stages of *spinosus* occur in epiphytic bromeliads. Two females from Panama provisionally identified as *spinosus* were taken in biting-landing collections.

DISTRIBUTION (fig.5). Costa Rica and Panama (Chiriqui mountains) at elevations above 4000 ft. Material examined: 85 specimens; 1 ♂, 6 ♀, 3 pupae, 75 larvae; 2 individual rearings (1 larval, 1 incomplete).

COSTA RICA. *Alajuela*: Volcan Poas, 14 Apr 1938, 2 1 [USNM]. *Cartago*: Cervantes, 9 Nov 1962, J.N. Belkin, C.L. Hogue and W.A. Powder (CR 13, type series), 1 lp♀ (13-111), 4 L [USNM, UCLA]. Cipreses, 1 ♀ [USNM]. La Sierra, elev. 6300 ft, 24 Nov 1962, C.L. Hogue and W.A. Powder, 55 L (CR 54) [UCLA]. *Locality not specified*: C. Picado, 1 ♂, 2 ♀ [UCLA, USNM].

PANAMA. *Bocas del Toro*: La Sierra, elev. 5400 ft, 8 Apr 1963, A. Quinonez, 5 L (PA 180), 1 ♀ (PA 181) [UCLA]. La Zorra, elev. 4400 ft, 5 Apr 1963, A. Quinonez, 1 L (PA 172); 6 Apr 1963, A. Quinonez, 1 lP (176-103), 1 P, 1 L (PA 176); 7 Apr 1963, A. Quinonez, 5 L (PA 179); 9 Apr 1963, A. Quinonez, 1 ♀ (PA 184) [UCLA].

Sexlineatus Group

FEMALE. *Head*: Median light line on vertex with narrow scales. Proboscis distinctly longer than forefemur. Torus with restricted mesal scale patch. *Thorax*: Mesonotal light lines mostly white, rarely creamy; inner and outer dorsocentral lines complete, subparallel; lateral marginal line continuous; scales on anterior promontory white. Antealar area above paratergite with dark scales. Paratergite with a moderate scale patch extending entire sclerite length. Upper *ppn* entirely covered with scales, both dark and light scales present; upper *stp* patch quadrate. *Legs*: Distal white spot on anterior surface of midfemur and hindfemur present. Tibiae predominantly dark, with light scales in narrow longitudinal lines. *Wing*: Veins entirely dark scaled. *Abdomen*: Basomedian tergal light markings present on III-VII.

MALE. Palpus with basomedian light scales on segments 4,5.

MALE GENITALIA. Lobe of tergite IX prominent, with 5,6 strong bristles. Sidepieces separated at base by a distance less than width of aedeagus; without any indication of lobes on tergomesal or sternomesal margins. Claspette represented by a conical tubercle. Aedeagus shorter than proctiger; apex smoothly rounded, without any indication of lateral lobes.

PUPA. *Cephalothorax*: Trumpet moderate, index about 5.0, distinctly flared apically; hairs 10,12-C usually with a few branches. *Abdomen*: Hair 5-IV-V moderate, not exceeding the apex of second tergite following; hair 9-VII moderate to strong, distinctly larger than hair 6, exceeding lateral angle of tergite. *Paddle*: Short; apex rounded.

LARVAE. *Head*: Hair 4-C weak, lightly pigmented, at least 4-branched; 5-C single, moderate, strongly pigmented; 6-C heavy, darkly pigmented, triple or double; 7-C moderate, double or triple; 15-C short, barely exceeding base of mental plate. *Thorax*: Roundish in outline; integument strongly spiculate, spicules hairlike, simple. *Abdomen*: Integument densely spiculate. Hair 8-VII slightly cephalodorsad of 9-VII. *Siphon*: Integument imbricate; acus distinct, attached. *Anal Segment*: Hair 3-X double; ventral brush with 5 pairs of hairs.

DISCUSSION. Only 1 species is recognized at this time in the Sexlineatus Group although it is evident, as indicated under the species, that there is considerable differentiation in some populations.

The Sexlineatus Group shows similarities with the Whitmorei Group in adult ornamentation (dark-scaled antealar area) and with the Allotecnon Group in the larva (head hair 15-C short). It is the most widespread of all the groups in the section and occurs at lower elevations than any other, particularly in the southern part of its range in Trinidad and in lowland Ecuador where it seems to be the only species of *Howardina* present (fig.4). In the central (Honduras, Panama) and northern (Mexico) portions of its range it occurs at moderate to high elevations and may be sympatric with the Allotecnon and Quadrivittatus Groups.

21. Aedes (Howardina) sexlineatus (Theobald)

Figs.4,9,43,44

1901.*Stegomyia sexlineata* Theobald, 1901:308. TYPE: Holotype ♀ (102), Agua Santa (St. George), Trinidad, F.W. Urich [BM].

1907.*Stegomyia dominicii* Rangel and Romero-Sierra, 1907:48. TYPE: ♀, Hacienda El Paraiso on Rio Anauco [Caracas], Venezuela [LU]. **NEW SYNONYMY.**

Aedes (Howardina) sexlineatus of Dyar (1928:229); Edwards (1932:155); Martini (1935:49); Komp (1936a:57); Lane (1939:101); Martinez and Prosen (1950:38-39); Lane (1953:715-716); Horsfall (1955:471); Martinez and Prosen (1955:23-25); Reyes (1955:74,89); Trapido, Galindo and Carpenter (1955:530,534,537); Vargas (1956:22); Galindo and Trapido (1957:122,124,125, 134); Trapido and Galindo (1957:134); Belkin, Schick and Heinemann (1965:69); Forattini (1965:113,232); Cova Garcia, Sutil and Rausseo (1966a:58,287; 1966b:74,141,334-335).

Aedes (Howardina) sexlineata of Bonne and Bonne-Wepster (1925:367-368).

Aedes sexlineatus of Urich (1913:527,528); Howard, Dyar and Knab (1917:847-849); Dyar (1918: 73); Cerqueira (1943b:33); Boshell-Manrique and Osorno-Mesa (1944:173,174,177,178); Del Ponte, Castro and Garcia (1951:240); Aitken (1960:4).

Aedes (Soperia) sexlineata of Anduze (1941:14).

Stegomyia sexlineata of Giles (1902:377); Theobald (1903b:238,239); Blanchard (1905:260).

Gymnometopa sexlineata of Coquillett (1905:183; 1906b:25); Theobald (1907:210; 1910:219); Surcouf and Gonzalez-Rincones (1911:212-213).

Haemagogus sexlineata of Dyar and Knab (1906a:166).

Aedes (Howardina) dominicii of Bonne and Bonne-Wepster (1925:376); Dyar (1928:231); Edwards (1932:155).

Aedes (Soperia) dominicii of Belkin, Schick and Heinemann (1965:74); Cova Garcia, Sutil and Rausseo (1966b:80).

Stegomyia dominicii of Surcouf and Gonzalez-Rincones (1911:131,134-135; 1912:286-287).

FEMALE. Wing: 2.8 mm. Proboscis: 2.2 mm. Forefemur: 1.9 mm. Abdomen: about 2.9 mm. *Head*: Light decumbent scales white. Erect scales whitish on occiput, dark brown on sides and disc. Palpus about 0.2 of proboscis, white scales on mesal surface and apex of segment 4. Torus light brown laterally, darker mesally and with white scales. *Thorax* (fig.9): Mesonotal light lines white to dingy white; inner and outer dorsocentral lines complete from anterior margin to scutellum, scales at level of prescutellar area lighter; lateral marginal line short, narrow from scutal angle to wingbase, scales longer, broader at wingbase. Antealar area above paratergite completely dark scaled. Median scutellar lobe with moderately broad dark scales laterally and with median narrow white scales from base to apex; lateral lobes with narrow dark scales. Paratergite scales broad, white. *Apn* scales white, predominantly broad, a few anterior scales narrower; upper *ppn* with narrow black scales on upper half, light to creamy narrow and broad scales on lower half, extent of black scales varied in different populations; *psp* scales distinct, narrow and creamy in front, broad and white behind; other scale patches pure white, distributed as in group. *Legs*: Forefemur dark anteriorly except for basal creamy scales, dark posteriorly except for a narrow creamy longitudinal line; midfemur mostly dark anteriorly except for basal creamy scales, a narrow mesal white line to middle and a white spot at distal 0.67, proximal 0.6 of posterior surface white, rest dark scaled; hindfemur predominantly dark anteriorly except for broad white line to 0.75 terminating in a white spot, posterior surface white to 0.75, rest dark scaled. Foretibia and midtibia predominantly dark except for anterior, narrow, faint white line; hindtibia dark. Foretarsus with white scales on segments 1,2; midtarsus with short incomplete white rings on 1,2, often a few white scales on 3; hindtarsus with broader white rings on 1-3, occasionally some white scales on segment 4 and sometimes on 5. *Haltere*: Stem pale, knob dark basally, fringe scales white. *Abdomen*: Basomedian tergal scales creamy, silvery on VII. Sternites with broad basal V-shaped pure white patches; apical white scales apparent up to segment V.

MALE. Wing: 2.61 mm. Proboscis: 2.43 mm. Forefemur: 1.8 mm. Essentially similar to female in color.

MALE GENITALIA (fig.43). As figured; diagnostic characters as in the key. Ninth tergite lobe prominent, with 5,6 moderate setae. Sidepiece length about 3.0 of median width. Clasper about 0.5 of sidepiece, spiculate in basal 0.33. Aedeagus short, apex uniformly sclerotized, smoothly rounded, without indication of apical lateral lobes.

PUPA (fig.43). Abdomen: 3.6 mm. Trumpet: 0.43 mm; index about 5.0. Paddle: 0.6 mm. Diagnostic characters as in the key. Chaetotaxy as given below, hairs moderately to darkly pigmented. *Cephalothorax*: Mesonotum moderately pigmented between trumpets, lateral areas and metanotum slightly darker; trumpets contrasting. Hair 1(1), 2(1), 3(1), 4(3, 2-5), 5(2, 2-3), 6(1, 1-2), 7(2, 2-3), 8(2, 1-4), 9(1), 10(4, 1-7), 11(1, 1-2), 12(3, 1-4). *Abdomen*: Tergite I uniformly strongly pigmented except for usual light membranous area; segments II-VIII with imbricate integument, strongly pigmented, progressively lighter caudad. Segment I: hair 1(6-13 primary branches, each with many secondary ones), 2(1, 1-2), 3(1, 1-2), 4(2, 2-4), 5(3, 1-6), 6(1, 1-2), 7(1, 1-4), 9(1, 1-3), 10(1-2; present in some), 11(1-4, present in some). Segment II: hair 0(1), 1(2, 1-7), 2(1, 1-2), 3(1, 1-2), 4(2, 1-4), 5(1, 1-2), 6(1, 1-2), 7(1, 1-2) present in some, 9(1), 10(1, present in some), 11(1-2, present in some). Segment III: hair 0(1), 1(3, 1-5), 2(1, 1-3), 3(1, 1-2), 4(2, 1-3), 5(1, 1-2), 6(1), 7(2, 1-3), 8(3, 2-4), 9(1), 10(1, 1-3), 11(1), 14(1). Segment IV: hair 0(1), 1(2, 2-5), 2(1), 3(2, 2-4), 4(2, 1-2), 5(2), 6(1), 7(2, 1-2), 8(2, 1-3), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(2, 1-3), 2(1, 1-2), 3(1, 1-3), 4(1, 1-3), 5(2), 6(1), 7(2, 1-4), 8(2, 1-3), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1, 1-2), 5(1, 1-2), 6(1), 7(1, 1-2), 8(2, 1-2), 9(1), 10(1, 1-2), 11(1), 14(1). Segment VII: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1), 5(1, 1-3), 6(2, 1-3), 7(1), 8(3, 1-4), 9(4, 2-5), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(6, 4-9), 14(1). *Paddle*: Uniformly moderately pigmented, midrib darker; external margin serrated, apex smooth; hair 1-X slender. Male genital lobe extending to 0.59 of paddle, female genital lobe to 0.41.

LARVA (fig.44). Head: 0.76 mm. Siphon: 0.65 mm. Anal Saddle: 0.27 mm. Chaetotaxy as given below, hairs moderately to darkly pigmented. *Head*: Mental plate with a strong median tooth and 9-11 distinct teeth on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(7, 4-8), 5(1, strong), 6(3, 2-3), 7(3, 2-3), 8(1), 9(2, 2-3), 10(2, 1-2), 11(17, 10-19, stellate), 12(1), 13(1), 14(12, 12-24, stellate), 15(2, 2-4). *Antenna*: Length about 0.3 of head; pigmentation moderate; shaft with a few scattered denticles. All hairs except 1-A single; hair 1-A (2, 2-3) about 0.6 from base. *Thorax*: Integument strongly pilose, spicules simple, hairlike; apices of long hairs attenuate and weakly barbed. Stellate hairs with many barbed branches. Prothorax: hair 0(23, 19-25), 1(5, 2-8), 2(1, 1-2), 3(20, 18-26), 4(1, 1-3), 5(1), 6(1), 7(2, 2-3), 8(20, 15-23), 9(17, 16-24), 10(1), 11(1, 1-2), 12(1), 13(20, 18-29), 14(32, 30-42). Mesothorax: hair 1(11, 8-15), 2(1), 3(1), 4(1), 5(1), 6(4, 3-5), 7(1), 8(5, 4-6), 9(5, 4-6), 10(1), 11(2, 1-4), 12(1, 1-2), 13(17, 12-21), 14(16, 10-20). Metathorax: hair 1(21, 9-21), 2(1), 3(8, 3-9), 4(13, 12-18), 5(11, 9-16), 6(1), 7(4, 3-5), 8(17, 12-19), 9(3, 2-5), 10(1), 11(2, 2-4). 12(1), 13(22, 16-26). *Abdomen*: Integument and stellate hairs as on thorax. Spicules as on thorax, but longer and more profuse on ventral side of segments. Segment I: hair 1(20, 12-21), 2(20, 18-25), 3(1), 4(1), 5(15, 13-20), 6(2, 2-3), 7(1), 9(7, 5-10), 10(1), 11(20, 12-23), 13(15, 9-16). Segment II: hair 0(1), 1(20, 16-26), 2(20, 16-24), 3(1), 4(1, 1-2), 5(16, 12-17), 6(2, 2-3), 7(9, 5-11), 8(1), 9(10, 6-13), 10(1, 1-2), 11(1, 1-2), 12(1), 13(14, 12-18). Segment III: hair 0(1), 1(20, 16-23), 2(20, 9-24), 3(1), 4(1), 5(14, 14-20), 6(2), 7(14, 11-17), 8(1), 9(14, 10-18), 10(1), 11(1), 12(1), 13(13, 11-17), 14(1). Segment IV: hair 0(1), 1(20, 12-21), 2(22, 13-25), 3(1), 4(1), 5(15, 12-20), 6(2), 7(13, 10-15), 8(1), 9(18, 11-19), 10(1), 11(1), 12(1), 13(11, 9-17), 14(1). Segment V: hair 0(1), 1(17, 12-21), 2(18, 17-24), 3(1), 4(1), 5(15, 13-20), 6(2), 7(12, 10-15), 8(1), 9(16, 13-19), 10(1), 11(1), 12(1), 13(10, 9-14), 14(1). Segment VI: hair 0(1), 1(17, 12-20), 2(18, 17-22), 3(1), 4(1), 5(16, 13-17), 6(1, 1-2), 7(11, 8-12), 8(1), 9(17, 11-19), 10(1), 11(1), 12(1), 13(12, 8-15), 14(1). Segment VII: hair 0(1), 1(18, 12-18), 2(18, 15-21), 3(1), 4(1), 5(13, 11-17), 6(8, 8-12), 7(1), 8(9, 8-10), 9(12, 12-21), 10(1), 11(1), 12(1), 13(9, 7-12), 14(1). *Segment VIII*: Comb scales in a single row, usually 10(8-14) in number;

individual scale long, pointed apically and fringed nearly to tip. Hair 0(1), 1(20, 17-24), 2(1), 3(7, 5-8), 4(1), 5(15, 12-17), 14(1). *Siphon*: Index about 2.1-2.4; integument moderately pigmented, imbricate. Pecten extending to 0.42-0.45, with 13-20 teeth; individual tooth long, pointed, with basal denticles. Hair 1(2, 2-3), 2(1), 3-5 not visible, 6(1), 7(1), 8(1, 1-2), 9(1). *Anal Segment*: Saddle moderately pigmented and weakly spiculate; caudal margin with spines of varying length. Gills moderate, about 1.5-2.0 of saddle length, ventral slightly shorter than dorsal. Hair 1(4, 3-5), 2(5, 3-6), 3(2), 4a(3, 2-4), 4b(2, 2-3), 4c(2, 2-3), 4d(2, 2-3), 4e(2, 2-3).

EGG. Length about 0.73 mm, width 0.1 mm; exochorion transparent, with circular clear refractile bodies; endochorion dark, with irregular polygonal sculpturing.

SYSTEMATICS. Formerly the name *sexlineatus* was applied to quite unrelated forms, some of which are now recognized as distinct species in other groups of the Sexlineatus Section. In the restricted sense used here, with the diagnostic features mentioned under the group and the species, *sexlineatus* appears to be a complex of several closely related forms. It is impossible at this time to resolve the complex owing to the paucity or total absence of associated immature stages and even adults from critical areas. The best diagnostic features of the complex are: (1) in the adults, the presence of dark scales on the upper *ppn* and antealar area; and (2) in the larvae, the presence of a dense vestiture of hairlike spicules on the thorax and abdomen; the aedeagus of the male genitalia may also prove to be distinctive. I have seen samples from populations with these characters from central and southern Mexico, Honduras, Panama, Ecuador, Venezuela and Trinidad. The species has been reported from intermediate areas but little reliance can be placed on these records although probably the complex does occur throughout Central America and in Colombia.

The description of the species is based on topotypic associated material from Trinidad. The females and 4 males from Venezuela are so similar to those from Trinidad except for slightly yellowish mesonotal lines that there is no question that they belong to the same taxon. No significant departure was noted in the limited material of immature stages from Venezuela. From the original description and illustration it is evident that *dominicii* Rangel and Romero, 1907 from the Rio Anauco is based on this population and it is therefore synonymized here with *sexlineatus*. The Trinidad and Venezuela populations appear to be confined to the coastal areas and are known from near sea level to moderate elevations in the coastal ranges.

The Ecuador population is known only by males and females from the lowlands of the Guayas River basin. These specimens resemble the typical populations except for fewer dark scales on the upper *ppn* and a tendency toward more extensive light scaling on the tarsi, some specimens showing some white scales on segment 3 of the foretarsus, segments 3 and/or 4 of the midtarsus and segments 4 and/or 5 of the hindtarsus. In the male genitalia, some of the setae of the ninth tergite lobe are slightly flattened, approaching the condition characteristic of *ecuadoriensis* of the Eleanorae Group.

Limited material of all stages has been examined from Panama. While the majority of adults agree with the typical populations, 2 show a preponderance of white scales on the upper *ppn*. I have not been able to detect any significant differences in the immature stages from the typical populations.

The 3 females from Honduras, 2 females from Colombia and all adults from Mexico differ from the typical populations apparently only in the presence of fewer dark scales on the upper *ppn*. In the limited material of immature stages from Mexico no significant differences from typical populations were noted. These populations are found at higher elevations than the typical ones, particularly the ones from Cuernavaca, Mexico (about 7,000 feet).

In the southern portion of the range, populations of *sexlineatus* are apparently largely or entirely restricted to the rain forest and tropical deciduous forest at low and moderate elevations. This may be the case even in Central America and Mexico where *sexlineatus* populations are known only from higher elevations where patches of such forests may be present.

BIONOMICS. Immature stages of *sexlineatus* have been collected only in epiphytic bromeliads. Females are readily attracted to human bait and Trapido and Galindo (1957) found that in Panama they bite both at ground level and in the forest canopy. Attempts at experimental infection with the yellow fever virus have yielded negative results in Trinidad (Aitken 1960:4). Similar negative results have been reported by Boshell-Manrique and Osorno-Mesa (1944:174,177,178) but it is doubtful that the species involved was actually *sexlineatus*.

DISTRIBUTION (fig.4). Mexico (southern part), probably Guatemala, Honduras, Nicaragua, possibly Costa Rica, Panama, Colombia (upper Orinoco drainage), Venezuela (northern), Trinidad and Ecuador (Guayas River basin) at elevations of 250-7000 ft. Material examined: 1099 specimens; 28 ♂, 684 ♀, 35 pupae, 352 larvae; 32 individual rearings (1 pupal, 24 larval, 7 incomplete).

COLOMBIA. *Boyaca*: Cuincha, 2 ♀; Guamales, 2 ♀; San Isidro, 3 ♀ (Boshell-Manrique and Osorno-Mesa 1944:174,177,178). *Meta*: Retiro, 15-16-19 Aug 1935, 2 ♀ [UCLA, USNM].

ECUADOR. Babahoyo, Aug 1938, F. Campos, 4 ♂, 18 ♀ [USNM]; Balzapamba, Aug 1938, F. Campos, 4 ♂, 1 ♀ [USNM], 6 ♀ (KO 209A-21), 1939 or 1941, H. Hansen, 2 ♀ (KO 209A-14) [UCLA]. Guayaquil, J. Murdock, 2 ♂, 3 ♀ [USNM].

HONDURAS. Tegucigalpa, 15 July 1945, 3 ♀ [USNM].

MEXICO. *Chiapas*: San Cristobal (Martini 1935:49). Tuxtla, 23 July 1963, E. Fisher (MF 8), 21 ♀; Sumidero, 17 Aug 1964, D. Verity, 1 lp♂ (117-11), 4 L (MEX 117), 1 lp♂ (118-10); 17 Aug 1964, E. Fisher and D. Verity, 1 ♀ (MEX 120), 1 ♀ (MEX 121), 8 ♀ (MEX 128) [UCLA]. *Morelos*: Cuernavaca, elev. 7000 ft, 29 July 1961, R. and K. Driesbach, 2 ♂, 2 ♀ [USNM]. *Veracruz*: Cordoba, 12 July 1964, E. Fisher and D. Verity, 5 ♀ (MEX 18), 1 ♀ (MEX 19), 1 ♀ (MEX 21); 13 July 1964, E. Fisher and D. Verity, 3 ♀ (MEX 26), 1 lp♂ (28-14), 1 lp♀ (28-11); 16 July 1964, E. Fisher and D. Verity, 1 L (MEX 38) [UCLA].

NICARAGUA. Villa Somoza, Aug, Sept, Nov 1953, 1 ♀ (Galindo and Trapido 1957:146).

PANAMA. *Bocas del Toro*: Almirante, 1952-53, 77 A (Trapido and Galindo 1957:122,125). *Cocle*: El Valle, elev. 2000 ft, 14 Aug 1963, A. Quinonez (PA 533), 1 lP (533-101); Valle de Anton, elev. 2400 ft, 13 Aug 1963, A. Quinonez (PA 504), 3 lp♂ (504-101,102,108), 1 lp♀ (504-104), 1 p♂ (504-103), 1 lP (504-106) [UCLA]. Tucue, elev. 1000 ft, 12 June-14 Dec 1950, 2 A (Trapido, Galindo and Carpenter 1955:530). *Panama*: Campana, elev. 2000 ft, 14 June-6 Dec 1950, 24 A (Trapido, Galindo and Carpenter 1955:530).

TRINIDAD. *Caroni*: Brasso Venado, elev. 400 ft, 21 June 1964, R.L. Manuel and R. Martinez, 24 ♀ (TR 513) [UCLA]. *Mayaro*: Bush Bush Forest, 9 Dec 1963, TRVL, 2 ♀ (TR 62); 20 Dec 1963, TRVL, 1 ♀ (TR 5); 27 Dec 1963, TRVL, 6 ♀ (TR 21); 30 Dec 1963, TRVL, 2 ♀ (TR 10); 17 Jan 1964, TRVL, 4 ♀ (TR 28); 22 Jan 1964, TRVL, 1 ♀ (TR 40) [UCLA]. *Nariva*: Archers Estate, 5 Nov 1964, A. Guerra, 1 ♀ (TR 819) [UCLA]. Biche, elev. 250 ft, 9 July 1964, F. Powdhar, 3 ♀ (TR 563) [UCLA]. Charuma Forest, elev. 500 ft, 27 Aug 1964, A. Guerra, 24 ♀ (TR 644); 8 Oct 1964, A. Guerra, 3 ♀ (TR 761) [UCLA]. *St. Andrew*: Caratal Road, elev. 250 ft, 3 Dec 1964, F. Powdhar, 1 ♀ (TR 866) [UCLA]. Coryal, elev. 250 ft, 18 June 1964, A. Guerra, 2 ♀ (TR 498) [UCLA]. Mt. Harris, 23-31 July 1924, C.L. Withycombe, 1 ♀ [USNM]; elev. 250 ft, 16 July 1964, F. Powdhar, 16 ♀ (TR 573) [UCLA]. Nestor Village, elev. 100 ft, 12 June 1965, A. Guerra, 1 ♀ (TR 484) [UCLA]. Tamana, 1945, 1 ♀ [USNM]; Mt. Tamana, elev. 250 ft, 19 June 1964, A. Guerra, 43 ♀ (TR 512); 20 Aug 1964, A. Guerra, 1 ♀ (TR 619); elev. 1000 ft, 23 Aug 1964, R.L. Manuel and R. Martinez, 5 ♀ (TR 620) [UCLA]. Valencia, Cumaca, elev. 1000 ft, 3 Sept 1964, A. Guerra, 2 ♀ (TR 654); El Quemado Road, elev. 250 ft, 3 July 1964, F. Powdhar, 1 ♀ (TR 547) [UCLA]. *St. David*: Sans Souci, elev. 250 ft, 5 Mar 1964, A. Guerra, 1 ♀ (TR 151) [UCLA]. *St.*

George: Aripo Valley, elev. 500 ft, 16 Apr 1964, A. Guerra, 1 ♀ (TR 330) [UCLA]. Blanchisseuse, 2 Aug 1945, 18 ♀; 2 Sept 1945, 1 ♀ [USNM]; 1 ♀ (KO 209A-36) [UCLA]; road to Blanchisseuse, 2 Mar 1945, 2 ♀ [USNM]. Guanapo Valley, elev. 1500 ft, 17 Apr 1964, A. Guerra, 1 ♀ (TR 339) [UCLA]. Heights of Guanapo, elev. 800 ft, 26 Mar 1964, A. Guerra, 1 ♀ (TR 259); elev. 1000 ft, 22 Apr 1965, A. Guerra, 63 ♀ (TR 1129) [UCLA]. La Laja Road, elev. 1000 ft, 11 Mar 1965, A. Guerra, 44 ♀ (TR 1036) [UCLA]. La Laja Trace, 11 Mar 1965, 2 lp♂ (1041-22,41), 1 lp♀ (1041-18), 2 lp (1041-21,23), 2 P, 33 L, 13 l [UCLA]. Las Lapas Trace, elev. 2000 ft, 3 Apr 1964, A. Guerra, 12 ♀ (TR 281) [UCLA]. Mt. Beck, elev. 1000 ft, 29 Apr 1965, A. Guerra, 1 ♀ (TR 1132) [UCLA]. Port of Spain, 26 Aug 1945, 1 ♀ [USNM]. Simla, 25 Mar 1965, M.J. Moody, 6 ♀ (TRM 15) [UCLA]. Springhill Estate, elev. 1200 ft, 25 Mar 1965, A. Guerra and M.J. Moody (TRM 12), 2 lp♀ (12-50,52), 10 L; 25 Mar 1965, A. Guerra, 2 lp♀ (1056-11,14), 1 P, 5 L, 1 l (TR 1056), 3 lp♀ (1063-31,81,82), 6 ♀, 86 L (TR 1063), 2 lp♂ (1064-11,12), 1 ♀, 3 L (TR 1064) [UCLA]. Verdant Vale, elev. 1000 ft, 10 Sept 1964, A. Guerra, 5 ♀ (TR 686); elev. 500 ft, 12 Nov 1964, A. Guerra, 21 ♀ (TR 831); 9 Apr 1965, elev. 1200 ft, A. Guerra, 3 ♀, 132 L (TR 1098), 1 lp♂ (1099-33), 3 lp♀ (1099-11,21,22), 3 lP (1099-12,31,32), 34 L [UCLA]. *County not specified*: June 1905, A. Busck, 15 ♀; A. Busck, 7 ♀; F.W. Urich, 1 ♀ [USNM].

VENEZUELA. *Anzoategui*: Puerto La Cruz, Sept 1944, W.H.W. Komp, 1 ♀ (KO 209A-15), 2 ♂ (KO 209A-20); 26 Sept 1944, W.H.W. Komp, 10 ♀ (KO 209A-24), 23 ♀ (KO 209A-27), 24 A (KO 209A-35) [UCLA]. *Aragua*: Guamitas, elev. 1200 m, 27 Jan 1927, M.N. Tovar, 3 ♀; 24 Aug 1927, M.N. Tovar, 136 ♀; 27 Aug 1927, M.N. Tovar, 1 ♀ [USNM]. La Providencia (Cova Garcia, Sutil and Rausseo 1966b:74). Maracay, 2 July 1927, M.N. Tovar, 2 ♀; M.N. Tovar, 1 ♀ [USNM]. Rancho Grande, 2 Nov 1962, I. Ortiz C., 7 ♀ [USNM]. Turmero (Cova Garcia, Sutil and Rausseo 1966b:74). *Distrito Federal*: Caracas, 21 July 1938, 1 ♂; P.J. Anduze, 1 ♂, 1 ♀ [USNM]; Hacienda El Paraiso, ♀ (Rangel and Romero-Sierra 1907). Carayaca (Cova Garcia, Sutil and Rausseo 1966b: 74). *Miranda*: El Hatillo (Cova Garcia, Sutil and Rausseo 1966b:74). *Monagas*: Guacharo, F.M. Root, 5 ♀ (VZR 267) [UCLA].

Whitmorei Group

FEMALES. *Head*: Median light line on vertex with moderately broad scales. Proboscis subequal to forefemur in length. Torus with an almost complete ring of white scales broken only dorsally. *Thorax*: Mesonotal light lines usually white to silvery; inner dorsocentral line complete; outer dorsocentral line shorter, not reaching anterior margin, diverging outwards anteriorly; lateral marginal line broken into narrow prescutal, antealar and supraalar patches; scales on anterior promontory white. Antealar area above paratergite with dark scales. Paratergite and *ppn* with restricted light patch confined to posterior half; upper *stp* patch narrow, elongate. *Legs*: Distal white spot on anterior surface of midfemur present, absent on hindfemur. Tibiae predominantly dark, with light lines or scattered scales. *Wing*: Veins entirely dark scaled. *Abdomen*: Basomedian tergal light markings absent.

MALES. Palpus predominantly dark, white scales restricted to base of segments 4 and 5.

MALE GENITALIA. Lobe of tergite IX prominent, with a few (5-7) strong or many (about 12) weak bristles. Sidepieces separated at base by a distance greater than width of aedeagus; tergomesal and/or sternomesal margins with more or less distinct median lobes. Claspette completely absent. Aedeagus moderate to long, shorter than or subequal to proctiger; apex deeply emarginate, with distinct apical horns.

PUPA (*whitmorei* only). *Cephalothorax*: Trumpets short, index about 3.0, not expanded apically; hair 10-C branched, 12-C single or double. *Abdomen*: Hair 5-IV-V moderate, not exceeding apex of second tergite following; hair 9-VII moderate, branched, exceeding lateral angle of tergite. *Paddle*: Moderate; apex rounded.

LARVA (*whitmorei* only). *Head*: Hairs 4-7-C moderately pigmented, all at least 5-branched; hair 15-C moderate, exceeding apex of mental plate. *Thorax*: Squarish in outline; integument strongly spiculate, spicules hairlike, simple. *Abdomen*: Integument strongly uniformly spiculate. Hair 8-VII slightly cephalodorsad of 9-VII. *Siphon*: Integument distinctly spiculate; acus distinct, attached. *Anal Segment*: Hair 3-X single; ventral brush with 5 pairs of hairs.

DISCUSSION. The Whitmorei Group of 2 species is the subgenus *Soperia* of authors, which is based on a misidentified species (see discussion under subgenus *Howardina*). This group is a very distinct one in adult ornamentation and male genitalia but is obviously related to other groups in the Sexlineatus Section. Its closest affinities seem to be with the Sexlineatus and Allotecnon Groups. The immature stages of *whitmorei* are less differentiated from other groups of the Sexlineatus Section than are those of *walkeri* from other groups of the Walkeri Section.

The Whitmorei Group is known at present only from Colombia, Venezuela, Bolivia and probably Argentina (fig.5). Although *whitmorei* and *pseudodominicii* have been found together in Meta, Colombia, the 2 species may be largely allopatric, *whitmorei* occupying the northern part of the range of the group. *A. pseudodominicii* penetrates into the Amazon basin at an elevation of less than 2,000 feet in Chimore, Bolivia and apparently into the La Plata basin at moderate elevations in northern Argentina. It is also possible that this group is represented on the eastern slope of the Andes in Ecuador (Levi-Castillo 1953:40).

22. Aedes (Howardina) whitmorei Dunn

Figs.5,9,45,46

1918.*Aedes whitmorei* Dunn, 1918:128-130. TYPE: Lectotype ♀, near emerald mines, Muzo, Colombia, 1916, E.R. Whitmore [USNM; selection of Stone and Knight 1956:226].

Aedes (Howardina) whitmorei of Bonne and Bonne-Wepster (1925:375); Dyar (1928:230); Edwards (1932:156); Horsfall (1955:471).

Aedes (Soperia) whitmorei of Lane (1939:98); Anduze (1941:14; 1943:193; 1947:357); Lane (1953:701-703); Reyes (1955:74,89); Stone and Knight (1956:226); Stone, Knight and Starcke (1959:173); Belkin, Schick and Heinemann (1965:9); Forattini (1965:405); Cova Garcia, Sutil and Rausseo (1966a:57,275; 1966b:80-81,141,339).

Aedes whitmorei of Antunes (1937b:77); Senevet and Quievreux (1941:258); Boshell-Manrique and Osorno-Mesa (1944:173,174,175,177,178).

Aedes (Soperia) dominicii of Komp (1936a:63; 1936b:73-74).

Aedes dominicii in part of Bates (1944:165,166; 1945:23; 1949:16,61,320); Bugher, Boshell-Manrique et al (1944:33,37).

FEMALE. Wing: 2.7 mm. Proboscis: 1.98 mm. Forefemur: 1.98 mm. Abdomen: about 2.4 mm. *Head*: Light decumbent scales on vertex silvery white. Erect scales light on occiput, darkened on sides. Palpus about 0.16 of proboscis, with silvery white scales on apex of segment 4. Torus with silvery white scales. *Thorax* (fig.9): Mesonotal light lines white; inner dorsocentral line very narrow; outer dorsocentral line narrow but with a distinct broad silvery spot of broad scales at anterior end in fossa; lateral marginal line broken into lateral prescutal line, a small antealar and a larger supraalar patches, lateral prescutal nearly continuous but apparently broken at level of humeral bristle. Median scutellar lobe laterally with broad dark scales and with median broad silvery white scales from base to apex; lateral lobes with a few narrow silvery white scales. Scales on paratergite broad, silvery. Pleural scales broad and silvery; lower *ppn* patch adjoining upper *ssp*; other patches as in the group. *Legs*: Forefemur predominantly dark on both sides except for narrow white longitudinal line posteriorly; midfemur dark anteriorly except for a silvery spot at distal 0.67, proximal 0.5 of posterior surface white, rest dark; hindfemur predominantly white anteriorly to 0.67, distal part dark, proximal 0.5 of posterior surface white, distal dark. Tibiae usually dark, a few whitish scales at base. Foretarsus and midtarsus with short incomplete white rings on segments 1,2; hindtarsus with moderately broad ones on 1-3. *Haltere*: Stem pale, knob predominantly dark, fringe scales whitish. *Abdomen*: Basomedian tergal pure white scales evident on segments V-VII. Sternites with broad basal V-shaped pure white patches; apical light scales inconspicuous.

MALE. Wing: 2.5 mm. Proboscis: 2.34 mm. Forefemur: 1.89 mm. Essentially similar to female in color; only apparent difference is a small ventromedian white spot on the proboscis.

MALE GENITALIA (fig.45). As figured; diagnostic characters as in the key. Ninth tergite lobe prominent, with 6,7 moderately strong bristles. Sidepiece rather short, length about 2.0 of median width; tergomesal margin with a row of unpigmented leaflike setae, sternomesal lobe with a dense tuft of pigmented leaflike setae on an elevated flap. Clasper about 0.5 of sidepiece, with spicules in basomesal area; spiniform moderately long, about 0.35 of clasper length. Aedeagus narrow, subequal to proctiger, apex deeply emarginate, with distinct horns curved laterally.

PUPA (fig.45). Abdomen: 2.86 mm. Trumpet: 0.32 mm; index about 3.0. Paddle: 0.67 mm. Diagnostic characters as in the key. Chaetotaxy as given below, hairs moderately pigmented. *Cephalothorax*: Mesonotum lightly pigmented between trumpets, lateral areas slightly darker; metanotum uniformly moderately pigmented. Trumpets short, strongly pigmented and contrasting. Hair 1(1), 2(1), 3(1), 4(3, 2-4), 5(2), 6(1), 7(2), 8(1, 1-3), 9(1, 1-2), 10(4, 2-5), 11(1), 12(2, 1-2). *Abdomen*: Tergite I uniformly lightly pigmented, except for usual membranous areas; rest of segments imbricate and lightly pigmented, progressively lighter caudad. Segment I: hair 1(7-12 primary branches, each with few secondary ones), 2(1), 3(1), 4(2, 2-3), 5(1, 1-3), 6(1), 7(1), 9(1), 10(1, present in a few), 11(2, 1-4, present in a few). Segment II: hair 0(1), 1(4, 2-5), 2(1), 3(1), 4(2, 2-3), 5(1, 1-2), 6(1), 7(1, 1-2), 8(1), 9(1), 10(1). Segment III: hair 0(1), 1(3, 2-5), 2(1), 3(1), 4(1, 1-2), 5(1, 1-2), 6(1), 7(2, 1-3), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(2, 2-4), 2(1), 3(2, 2-3), 4(1), 5(2), 6(1), 7(2, 2-4), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(2, 2-3), 2(1), 3(1), 4(2, 1-4), 5(1), 6(1), 7(2, 2-5), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1, 1-3), 2(1), 3(1), 4(1, 1-2), 5(2), 6(1), 7(1, 1-3), 8(1, 1-2), 9(1), 10(1, 1-2), 11(1), 14(1). Segment VII: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1), 5(1), 6(2, 2-3), 7(1), 8(3, 3-4), 9(5, 4-6), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(10, 8-11), 14(1, 1-2). *Paddle*: Uniformly lightly pigmented, midrib slightly darker; external margin serrated. Male genital lobe extending to 0.5 of paddle, female genital lobe to 0.39.

LARVA (fig.46). Head: 0.84 mm. Siphon: 0.81 mm. Anal Saddle: about 0.3 mm. Diagnostic characters as in the key. *Head*: Width subequal to length; pigmentation moderate except around mouthparts where it is deeper. Mental plate with a strong median tooth and 11 distinct teeth on each side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(15, 10-16), 5(6, 5-8), 6(7, 6-7), 7(14, 11-17), 8(3, 3-6), 9(11, 8-14), 10(1), 11(20, 16-20), 12(5, 4-7), 13(1), 14(14, 11-14), 15(3, 2-3). *Antenna*: Length about 0.32 of head; shaft rather uniformly pigmented and with a few scattered spicules; hair 1(3, 2-3), other single. *Thorax*: Stellate hairs with many unequal, weakly barbed branches; long hairs attenuate apically and weakly barbed. Prothorax: hair 0(19, 19-23), 1(5, 4-6), 2(1), 3(21, 13-23), 4(1), 5(1), 6(1), 7(2), 8(20, 16-20), 9(14, 14-17), 10(1), 11(1), 12(1), 13(22, 20-25), 14(34-51). Mesothorax: hair 1(14, 13-20), 2(1), 3(1), 4(1), 5(1), 6(5, 4-6), 7(1), 8(6, 6-7), 9(5, 4-6), 10(1), 11(2, 1-3), 12(1), 13(17, 10-19), 14(16, 16-21). Metathorax: hair 1(25, 20-27), 2(1), 3(2, 1-2), 4(18, 17-19), 5(18, 17-23), 6(1), 7(5, 4-6), 8(18, 16-22), 9(4, 3-6), 10(1), 11(2, 1-2), 12(1), 13(22, 19-24). *Abdomen*: Integument and stellate hairs as on thorax. Segment I: hair 1(23, 20-25), 2(20, 20-25), 3(1), 4(1), 5(16, 14-23), 6(2, 2-3), 7(1), 9(8, 7-8), 10(1), 11(18, 15-20), 13(22, 22-25). Segment II: hair 0(1), 1(21, 20-24), 2(22, 18-25), 3(1), 4(1), 5(24, 18-24), 6(2, 2-3), 7(10, 9-10), 8(1), 9(14, 9-15), 10(1), 11(1), 12(1), 13(20, 19-24). Segment III: hair 0(1), 1(22, 19-25), 2(21, 18-27), 3(1), 4(1), 5(19, 17-26), 6(2), 7(17, 14-20), 8(1), 9(16, 14-21), 10(1), 11(1), 12(1), 13(20, 16-26), 14(1). Segment IV: hair 0(1), 1(20, 17-24), 2(22, 20-22), 3(1), 4(1), 5(22, 18-25), 6(2), 7(15, 9-18), 8(1), 9(19, 18-23), 10(1), 11(1), 12(1), 13(18, 14-20), 14(1). Segment V: hair 0(1), 1(22, 16-23), 2(19, 17-23), 3(1), 4(1), 5(20, 18-23), 6(2), 7(15, 12-18), 8(1), 9(19, 18-24), 10(1), 11(1), 12(1), 13(19, 16-22), 14(1). Segment VI: hair 0(1), 1(19, 19-23), 2(19, 18-23), 3(1), 4(1), 5(21, 18-22), 6(1), 7(11, 10-18), 8(1), 9(20, 17-21), 10(1), 11(1), 12(1), 13(17, 13-18), 14(1, 1-2). Segment VII: hair 0(1), 1(20, 18-21), 2(18, 16-22), 3(1), 4(1), 5(16, 16-22), 6(10, 10-13), 7(1), 8(10, 8-11), 9(16, 11-18), 10(1), 11(1), 12(1), 13(11, 10-14), 14(2, 1-2). *Segment VIII*: Comb scales usually 12(9-12) in number, in a single row; individual scale long, pointed apically and fringed almost to tip. Hair 0(1), 1(28, 22-28), 2(1), 3(8, 7-9), 4(1), 5(15, 10-19), 14(2, 2-3). *Siphon*: Index about 3.0, distinctly swollen in middle; integument uniformly moderately to strongly pigmented, with darker basal ring, uniformly spiculate. Pecten teeth usually 16(14-20) in number, extending to 0.4 before hair 1-S. Hair 1(3, 2-3), 2(1), 3-5 not visible, 6(1), 7(1), 8(1, 1-2), 9(1). *Anal Segment*: Saddle strongly pigmented, with darker basal ring; integument uniformly covered with spicules; caudal margin with spines of varying length; gills subequal, long, more than 2.0 of saddle length. Hair 1(2), 2(4, 3-4), 3(1), 4a(2), 4b(2), 4c(2, 1-2), 4d(2, 1-2), 4e(1, 1-2).

SYSTEMATICS. *A. whitmorei* is a very strikingly differentiated species erroneously synonymized with *dominicii* by Komp (1936a:53); the latter as shown here is undoubtedly *sexlineatus* (see). Its only close relative is *pseudodominicii*, whose immature stages are unknown. In ornamentation of the adults and in male genitalia the 2 species are readily separated by the features mentioned in the diagnoses and keys. *A. whitmorei* is known at present from both sides of the Cordillera Oriental in Colombia and from the Cordillera de la Costa in northcentral Venezuela; it probably occurs also in the intermediate areas in the Cordillera de Merida in western Venezuela. On the eastern slope of the Cordillera Oriental *whitmorei* is sympatric with *pseudodominicii* whose distribution extends on down to northern Argentina along the eastern slopes of the Andes.

BIONOMICS. Immature stages of *whitmorei* have been collected in epiphytic bromeliads at elevations of about 3,000 feet. Dunn's (1918:130) record from "small heavily shaded pools of clear but apparently stagnant water" is probably erroneous. According to Bates (1949:16,61), *whitmorei* (as *dominicii*) is a relatively common diurnal forest mosquito in the region of Villavicencio in Colombia; the females bite both at ground level and in tree stations; and males are often observed hovering over men and animals in the forest. Experimental infections of this species (also as *dominicii*) with yellow fever virus have been unsuccessful (Bugher, Boshell-Manrique et al

1944:33,37).

DISTRIBUTION (fig.5). Colombia (upper Orinoco and Magdalena drainages) and Venezuela (Cordillera de Merida and Cordillera de la Costa) at moderate elevations. Material examined: 104 specimens; 32 ♂, 43 ♀, 7 pupae, 22 larvae; 7 individual larval rearings.

COLOMBIA. *Boyaca*: Las Animas, 500 yds from mine, 17 Aug 1916, 6 ♀ [USNM]. Muzo, emerald mines, E.R. Whitmore, 1 ♀; 16 Aug 1916, E.R. Whitmore, 10 ♀, type series [USNM]. Guamales, 51 ♀; Tamborredondo, 1 ♀; Cuincha, 162 ♀; San Isidro, 37 ♀ (Boshell-Manrique and Osorno-Mesa 1944:174,175,177,178). *Meta*: Palucho, 3 ♂, 2 ♀ [USNM]. Restrepo, 17 July 1935, W.H.W. Komp, 1 ♂, 1 ♀ (KO 203A-10); 20 Aug 1935, W.H.W. Komp, 1 ♂ (KO 209A-2) [UCLA]; Aug 1935, W.H.W. Komp, 2 ♂, 3 ♀; 9 Sept 1935, W.H.W. Komp, 1 ♂, 2 ♀, 10 l [USNM], 2 ♂, 3 ♀ (KO 209A-28) [UCLA]; 1935, W.H.W. Komp, 1 ♂ (KO 209A-40), 1 ♂ (KO 209A-42), 1 ♂ (KO 209A-44) [UCLA]; July 1935, 2 ♂; Sept 1935, 2 ♀; 1935, 2 ♂; 4 June 1940, 1 ♂; 2 ♂ [USNM]; Retiro, 22 Aug 1935, W.H.W. Komp, 5 ♂; 15-16-19 Aug 1935, 2 ♀ [USNM]. Villavicencio, Buena Vista, elev. 3000 ft, 9 July 1965, E. Osorno-Mesa et al (COB 68), 1 lp♂ (68-30), 2 L [UCLA]; 4 June 1942, W.H.W. Komp, 2 ♂ [USNM]; Forzosa, 25 Oct 1943, M. Bates, 1 ♀ [USNM]; Quebrada Colorado, elev. 2300 ft, 9 July 1965, E. Osorno-Mesa et al (COB 67), 4 lp♂ (67-20,22,23,25), 2 lp♀ (67-21, 24), 3 L [UCLA].

VENEZUELA. *Aragua*: Ocumare de la Costa, 5 July 1927, M.N. Tovar, 5 ♀ [USNM]. Rancho Grande, 2 Nov 1942, I. Ortiz C., 3 ♀ [USNM]. *Distrito Federal*: Caracas (Anduze 1943:193; Cova Garcia, Sutil and Rausseo 1966b:80). Cementerio (Cova Garcia, Sutil and Rausseo 1966b:81). *Merida*: Bailadores (Cova Garcia, Sutil and Rausseo 1966b:81). Tovar (Anduze 1947:357). *Tachira*: Jaurequi and Uribante (Anduze 1947:357).

23. Aedes (Howardina) pseudodominicii Komp

Figs.5,9,58

1936.*Aedes pseudodominicii* Komp, 1936a:75. TYPE: Holotype ♂, Restrepo, Meta, Colombia, Aug-Sept 1935, E. Osorno-Mesa [NE].

1955.*Aedes (H.) delpontei* Martinez and Prosen, 1955:35-40. TYPE: Holotype ♂, Chapare, Cochabamba, Bolivia, elev. 6000 ft, Jan 1949, Feb 1952 or Nov 1953, Martinez and Prosen [MEPRA]. **NEW SYNONYMY.**

Aedes (Soperia) pseudodominicii of Komp (1936b:63; 1956:37).

Aedes (Soperia) dominicii of Antunes (1937a:16; 1937b:76-77); Lane (1939:98); Senevet and Quievreux (1941:258); Anduze (1943:192-193); Boshell-Manrique and Osorno-Mesa (1944:173, 174,175,177,178); Levi-Castillo (1952:555; 1953:40); Lane (1953:700-701); Reyes (1955:73, 89); Stone, Knight and Starcke (1959:173); Forattini (1965:405).

Aedes (Soperia) dominicii in part of Bates (1944:165,166; 1945:23; 1949:16,61,320); Bugher, Boshell-Manrique, et al (1944:33,37).

Aedes (Howardina) dominicii of Horsfall (1955:471).

Aedes (H.) delpontei of Martinez and Prosen (1959:603,605); Stone, Knight and Starcke (1959: 174); Prosen, Carcavallo and Martinez (1964:104,119).

FEMALE. Wing: 3.42 mm. Proboscis: 2.61 mm. Forefemur: 2.61 mm. Abdomen: about 3.24 mm. Similar to *whitmorei* but usually slightly larger in size and differing in the following. *Head*: Light decumbent scales white. Erect scales on occiput and sides whitish. Palpus about 0.17 of proboscis, with a few mesal and apical white scales on segment 4. Torus scales white. *Thorax* (fig.9): Mesonotal light lines white, rarely faintly creamy; inner and outer dorsocentral line without silvery spot in fossal area. Scutellar light scales white. Pleural scale patches white and distributed as in *whitmorei. Legs*: Forefemur predominantly auburn except for a few basal white scales anteriorly and a narrow longitudinal line posteriorly; midfemur predominantly auburn except for a white spot at distal 0.67 anteriorly and a mesal white line to middle posteriorly; hindfemur predominantly white on both sides, rest mostly auburn; midfemur and hindfemur with a short mesal patch merging with knee spot. Foretibia predominantly auburn, with a few scattered white scales; midtibia and hindtibia with a continuous white line, rest auburn. Foretarsus with a few white scales on segment 1; midtarsus with short incomplete white ring on 1; hindtarsus with broader white rings on segments 1,2. *Haltere*: Stem brownish, knob predominantly auburn, with a few white fringe scales. *Abdomen*: Basal sternal light scales white, apical white scales apparent to segment V, rest auburn.

MALE. Wing: 2.52 mm. Proboscis: 2.34 mm. Forefemur: 1.9 mm. Essentially similar to female in color. Proboscis completely dark.

MALE GENITALIA (fig.58). As figured; diagnostic characters as in the key. Ninth tergite lobe prominent, with many (about 12) narrow bristles. Sidepiece rather short, broader at the middle, tergomesal area with few and sternomesal area with numerous narrow setae. Clasper about 0.6 of sidepiece, stout, curved; spiniform short. Aedeagus shorter than proctiger; dorsal sclerotization deeply emarginate, apical horns distinct, curved upwards and dorsally.

PUPA, LARVA unknown.

SYSTEMATICS. *A. pseudodominicii* is a distinct, clearly marked species erroneously synonymized by Antunes (1937a:16) with *dominicii*; the latter is actually *sexlineatus* (see). On the basis of ornamentation of the adults (only stages known), *pseudodominicii* is evidently closely related to *whitmorei*, which has also been confused (Komp 1936a:53; 1936b:73-74) with *dominicii*. The 2 species are easily distinguished by the diagnostic features given above. *A. pseudodominicii* apparently occurs at moderate elevations only along the eastern slopes of the Andes, from the Cordillera Oriental in Colombia, where it is sympatric with *whitmorei*, all the way down to northern Argentina. It penetrates the upper reaches of the 3 main eastern drainage systems of South America, the Orinoco, Amazon and La Plata. Although I have not seen any of the type material of *delpontei* Martinez and Prosen, 1955, it is evident that this population from Bolivia is conspecific with the typical population from Colombia as the original description of *delpontei* obviously matches in all pertinent details the diagnostic features of *pseudodominicii* as do 2 females collected by Torres-Munez at the type locality of *delpontei*. I have not seen the female paratype of *delpontei* from Argentina but see no reason to doubt its conspecificity with the material from Bolivia and Colombia.

BIONOMICS. The immature stages of *pseudodominicii* are unknown but undoubtedly will be found in epiphytic and/or terrestrial bromeliads. It is very likely that the reports of Bates (1949) and Bugher and Boshell-Manrique et al (1944) mentioned under *whitmorei* apply at least in part to *pseudodominicii* since at that time both species were probably identified as *dominicii*.

DISTRIBUTION (fig.5). Colombia (upper Orinoco and Magdalena drainages), Bolivia (upper Amazon drainage) and Argentina (upper La Plata drainage) at moderate elevations. Material examined: 20 specimens; 10 ♂, 10 ♀; no individual rearings.

ARGENTINA. *Salta*: Campamento San Pedro S.O.C., Departamento San Martin, 1 ♀ paratype of *delpontei* (Martinez and Prosen 1955:40).

BOLIVIA. *Cochabamba*: Chapare, Chimore, 29 June 1944, Torres-Munoz, 1 ♀; 29 Apr 1944, 1 ♀ [USNM]. *La Paz*: Nor Yungas, A (Prosen, Carcavallo and Martinez 1964:104).

COLOMBIA. *Boyaca*: La Bodega, 22 ♀; Guamales, 58 ♀; Tamborredondo, 33 ♀; Cuincha, 19 ♀;

San Isidro, 15 ♀ (Boshell-Manrique and Osorno-Mesa 1944:173,174,175,177,178). *Meta*: Palucho, 2 ♂ [USNM]. Restrepo, 26 July 1935, W.H.W. Komp, 1 ♀ (KO 209A-39); 20 Aug 1935, W.H.W. Komp, 4 ♂ (KO 209A-2) [UCLA]; 7 Sept 1935, E. Osorno-Mesa, 1 ♂; 1935, W.H.W. Komp, 1 ♂; July 1935, 1 ♀ [USNM]; Retiro, 26 July 1935, W.H.W. Komp, 3 ♀ (KO 209A-31) [UCLA]; 15-19 Aug 1935, 1 ♂, 2 ♀ [USNM]. Villavicencio, Buena Vista, 4 June 1942, W.H.W. Komp, 1 ♂ [USNM].

Allotecnon Group

FEMALES. *Head*: Median light line on vertex with narrow scales. Proboscis distinctly longer than forefemur. Torus with a restricted mesal scale patch. *Thorax*: Mesonotal light lines golden; inner and outer dorsocentral lines complete, subparallel; lateral marginal line continuous; scales on anterior promontory creamy to golden. Antealar area above paratergite with golden scales. Paratergite with a moderate scale patch extending entire sclerite length. Upper *ppn* entirely covered with light scales; upper *stp* patch narrow, elongate. *Legs*: Distal white spot on anterior surface of midfemur and hindfemur present. Tibiae completely dark. *Wing*: Veins entirely dark scaled. *Abdomen*: Basomedian tergal light markings present on III-VII.

MALE (*allotecnon* only). Palpus with basomedian light scales on segments 4 and 5.

MALE GENITALIA (*allotecnon* only). Lobe of tergite IX not prominent, with 3,4 strong bristles. Sidepieces separated at base by a distance less than width of aedeagus; without any indication of lobes on tergomesal or sternomesal margins. Claspette represented by a conical tubercle. Aedeagus shorter than proctiger; apex shallowly emarginate, lateral lobes inconspicuous.

PUPAE. *Cephalothorax*: Trumpet moderate, index about 6.5, not expanded apically; hairs 10,12-C usually single or double. *Abdomen*: Hair 5-IV-V long, usually exceeding apex of second tergite following; hair 9-VII short, slightly larger than 6, usually not exceeding lateral angle of tergite. *Paddle*: Moderate to long, usually slightly produced on apex.

LARVAE. *Head*: Hair 4-C weak, lightly pigmented, at least 4-branched; 5-C single, moderate, strongly pigmented; 6-C heavy, strongly pigmented, double; 7-C moderate, double or triple; 15-C very short, not extending cephalad of base of mental plate. *Thorax*: Quadrate in outline; integument glabrous. *Abdomen*: Integument covered with small spinelike spicules, restricted to dorsal and ventral surfaces (only ventral in *guerrero*). Hair 8-VII caudolaterad of 9-VII. *Siphon*: Integument imbricate; acus distinct, separate. *Anal Segment*: Hair 3-X double; ventral brush with 5 pairs of hairs.

DISCUSSION. The Allotecnon Group of 3 species is readily recognized by the unique pleural scale pattern of the adults (particularly the long narrow upper *stp* scale patch) and the short, spinelike spicules on the abdominal segments of the larvae.

The group is known only in Central America and is sympatric with the Quadrivittatus Group from southern Mexico to central Panama (figs.5,6). *A. allotecnon*, the only widespread species, occupies primarily the central and southern parts of the range of the group but is also known from Chiapas and the southern end of the Sierra Madre Oriental in Mexico; *guerrero* is apparently endemic to the Sierra Madre del Sur in Mexico; and *guatemala* is known only from 2 collections on the Pacific slope of central Guatemala. The 3 species appear to be allopatric.

24. Aedes (Howardina) allotecnon Kumm, Komp and Ruiz

Figs.6,9,47,48

1940.*Aedes (Howardina) allotecnon* Kumm, Komp and Ruiz, 1940:417. TYPE: Lectotype ♂ with associated larval skin, Poas Volcano, Costa Rica, elev. 9000 ft, 14 Apr 1933, H.W. Kumm [USNM; selection of Stone and Knight 1956:214].

Aedes (Howardina) allotecnon of Kumm and Komp (1941:18-22); Kumm and Zuniga (1942:404); Trapido, Galindo and Carpenter (1955:530,534); Stone and Knight (1956:213); Vargas (1956: 22); Stone, Knight and Starcke (1959:173); Belkin, Schick and Heinemann (1965:12); Forattini (1965:399); Stone (1967:208).

FEMALE. Wing: 3.5 mm. Proboscis: 2.71 mm. Forefemur: 2.1 mm. Abdomen: about 3.24 mm. *Head*: Light decumbent scales on median stripe and short orbital line creamy; broad light scales on sides and venter whitish. Erect scales on occiput dark. Palpus about 0.19 of proboscis, with white scales on apex and mesal side of segment 4. *Thorax* (fig.9): Inner and outer dorsocentral lines creamy to pale golden, complete; lateral marginal line short, extending from scutal angle to wingbase, appearing broad due to presence of creamy scales in antealar area above paratergite. Median scutellar lobe with moderately broad dark scales laterally and median creamy to golden narrow scales from base to apex; lateral lobes with a few narrow creamy scales. Paratergite with broad white scales. *Apn* with predominantly broad white scales, some anterior ones narrow, creamy. *Ppn* with large upper patch of narrow creamy scales and small lower patch of broad white scales; *psp* without scales; other scale patches silvery white and distributed as in group. *Legs*: Forefemur predominantly dark anteriorly except for basal creamy scales, posterior surface mostly creamy to middle and with a narrow light line bordered on sides by dark scales extending distally; midfemur mostly dark anteriorly except for basal creamy scales and a silvery spot at distal 0.67, mainly creamy posteriorly, dark scales restricted to distal half; hindfemur creamy anteriorly to 0.67 and dark distally except for a silvery spot at 0.75, creamy posteriorly to proximal 0.5, rest dark. Foretarsus with basal white scales on segment 1; midtarsus with short, incomplete white rings on 1,2; hindtarsus with moderate white rings on 1-3. *Haltere*: Stem pale, knob mainly dark, a few fringe scales whitish. *Abdomen*: Basomedian tergal light scales white from segment III distad. Sternites with broad basal V-shaped patches, creamy at base, silvery on sides; median apical light scales evident to segment IV.

MALE. Wing: 2.62 mm. Proboscis: 2.19 mm. Forefemur: 1.77 mm. Essentially similar to female in color. Mesal light scale patch on torus absent.

MALE GENITALIA (fig.47). As figured; diagnostic characters as in the key. Ninth tergite lobe not prominent, with 3,4 strong setae. Sidepiece length 3.0 of median width. Clasper about 0.6 of sidepiece, with 2 preapical hairs; spiniform short, about 0.25 of clasper. Aedeagus shorter than proctiger; dorsal sclerotization shallowly emarginate, lateral lobes inconspicuous.

PUPA (fig.47). Abdomen: 3.08 mm. Trumpet: 0.43 mm; index 6.5. Paddle: 0.7 mm. Diagnostic characters as in the key. Chaetotaxy as given below; hairs moderately to darkly pigmented. *Cephalothorax*: Mesonotum moderately pigmented between trumpets, lateral areas and metanotum slightly darker; trumpets contrasting. Hair 1(1), 2(1, 1-2), 3(1, 1-2), 4(2, 2-4), 5(2), 6(1, 1-2), 7(2), 8(1, 1-3), 9(1), 10(1, 1-4), 11(1), 12(2, 1-2). *Abdomen*: Tergite I deeply pigmented, except for usual membranous areas; tergites II and III deeply pigmented, other segments lighter. Segment I:

hair 1(5-13 primary branches, each with many secondary ones), 2(1, 1-2), 3(1, 1-2), 4(3, 2-5), 5(1, 1-2), 6(1, 1-2), 7(1, 1-2), 9(1), alveoli of 10,11 present in some. Segment II: hair 0(1), 1(3, 2-6), 2(1), 3(1, 1-2), 4(3, 2-5), 5(1), 6(1, 1-2), 7(1, 1-2), 8(1, present in a few), 9(1). Segment III: hair 0(1), 1(3, 2-4), 2(1), 3(1), 4(1, 1-2), 5(1), 6(1), 7(2, 1-4), 8(1, 1-3), 9(1) 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(2, 2-3), 2(1), 3(2, 1-4), 4(1), 5(2, 1-3), 6(1), 7(2, 1-4), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(2, 1-3), 2(1), 3(1), 4(2, 1-3), 5(2, 1-2), 6(1), 7(2, 2-4), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1), 5(1, 1-2), 6(1), 7(1, 1-2), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1, 1-2), 4(1, 1-4), 5(1, 1-2), 6(2, 1-4), 7(1), 8(2, 1-3), 9(3, 2-7), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(3, 3-5), 14(1). *Paddle*: Uniformly lightly pigmented, midrib darker; external margin serrated; hair 1-P slender. Male genital lobe extending to about 0.4 of paddle, female genital lobe to 0.35.

LARVA (fig.48). Head: 0.84 mm. Siphon: 1.00 mm. Anal Saddle: 0.32 mm. Readily separated from *guerrero* by the presence of abdominal spicules on both dorsal and ventral surfaces and anal saddle with distinct large marginal spicules ventrad of hair 1-X. *Head*: Width about 1.06 of length. Pigmentation moderate except around mouthparts where it is deeper. Mental plate with a strong median tooth and usually 11(11,12) distinct teeth on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(5, 4-8), 5(1), 6(2), 7(3, 2-3), 8(1), 9(3, 3-5), 10(2, 1-3), 11(12, 9-17), 12(1, 1-2), 13(1, 1-2), 14(8, 4-9), 15(2, 2-3). *Antenna*: Length about 0.37 of head. Pigmentation moderate; shaft with a few scattered spicules. All hairs except 1, single; hair 1-A (2, 2-4) at about 0.63 from base. *Thorax*: Apices of long hairs attenuate; barbs present on both long and stellate hairs. Prothorax: hair 0(24, 17-29), 1(6, 4-7), 2(1), 3(16, 11-19), 4(2, 1-2), 5(3, 2-3), 6(1), 7(3, 2-4), 8(28, 24-30), 9(28, 22-28), 10(1), 11(2, 2-4), 12(1), 13(33, 22-35), 14(30, 24-38). Mesothorax: hair 1(11, 6-14), 2(1), 3(1), 4(1), 5(1), 6(6, 4-7), 7(1), 8(6, 5-6), 9(7, 5-8), 10(1), 11(2, 1-2), 12(1), 13(16, 10-17), 14(8, 8-13). Metathorax: hair 1(16, 12-25), 2(1), 3(5, 4-9), 4(17, 13-20), 5(15, 13-20), 6(1), 7(6, 3-8), 8(11, 10-14), 9(4, 3-6), 10(1), 11(1, 1-2), 12(1), 13(27, 20-33). *Abdomen*: Integument of segment I glabrous; other segments with spinelike spicules on dorsal and ventral surfaces. Stellate hairs with branches of unequal length. Segment I: hair 1(19, 12-20), 2(28, 17-28), 3(1), 4(6, 4-8), 5(16, 12-19), 6(3, 2-3), 7(1, 1-2), 9(6, 5-9), 10(1), 11(17, 13-21), 13(10, 8-10). Segment II: hair 0(1), 1(17, 11-20), 2(26, 17-26), 3(1), 4(6, 4-8), 5(16, 14-20), 6(3, 2-3), 7(9, 6-11), 8(1, 1-3), 9(6, 4-9), 10(1), 11(1), 12(1), 13(9, 7-16). Segment III: hair 0(1), 1(18, 8-22), 2(24, 16-27), 3(1), 4(1), 5(17, 12-26), 6(2, 2-3), 7(9, 6-12), 8(1), 9(14, 10-18), 10(1), 11(1), 12(1), 13(6, 5-12), 14(1). Segment IV: hair 0(1), 1(14, 5-18), 2(23, 15-27), 3(1, 1-2), 4(1), 5(15, 10-20), 6(2, 2-3), 7(9, 6-13), 8(1), 9(16, 12-22), 10(1), 11(1), 12(1), 13(7, 4-12), 14(1). Segment V: hair 0(1, 1-2), 1(12, 5-15), 2(19, 15-25), 3(1), 4(1, 1-3), 5(15, 11-18), 6(2), 7(8, 6-11), 8(1), 9(16, 11-23), 10(1), 11(1), 12(1), 13(8, 4-10), 14(1). Segment VI: hair 0(1), 1(14, 6-15), 2(17, 13-24), 3(1), 4(1), 5(12, 10-19), 6(2, 2-3), 7(8, 6-11), 8(1), 9(14, 11-17), 10(1), 11(1), 12(1), 13(8, 4-10), 14(1, 1-2). Segment VII: hair 0(1), 1(11, 6-16), 2(16, 11-20), 3(1), 4(1), 5(11, 8-17), 6(9, 6-14), 7(1), 8(5, 3-7), 9(13, 10-21), 10(1), 11(1), 12(1), 13(7, 3-14), 14(1, 1-3). *Segment VIII*: Comb scales in a single row, usually 14(12-20) in number; individual scale elongate, pointed apically and evenly fringed nearly to tip. Hair 0(1), 1(10, 8-20), 2(1), 3(5, 4-6), 4(1), 5(6, 4-8), 14(2, 1-4). *Siphon*: Index about 4.0-4.2; integument moderately pigmented, imbricate. Pecten extending to about 0.55, with 22(17-24) teeth; individual tooth pointed apically, with basal denticles. Hair 1(3, 2-3), 2(1), 3-5 not visible, 6(1), 7(1), 8(1), 9(1). *Anal Segment*: Saddle imbricate; moderately pigmented, with darker basal ring; caudal margin with spines of varying sizes dorsad and ventrad of hair 1-X. Gills subequal, about 2.0 of saddle length. Hair 1(3, 2-4), 2(4, 3-5), 3(2), 4a(4, 2-4), 4b(3, 3-4), 4c(4, 3-4), 4d(3, 2-4), 4e(2, 2-3).

SYSTEMATICS. *A. allotecnon* is the most widespread and most common of the 3 allopatric species in the Allotecnon Group. Its known range extends from the southern end of the Sierra Madre Oriental in Mexico to central Panama. The only significant variation noted in the large series of specimens was the presence of a few silvery scales on upper *ppn* in the 2 females from Mexico (MEX 14,16). Although this condition tends toward *guerrero* the 2 forms appear to be distinct in other adult features and the 3 larvae of *allotecnon* from Mexico are clearly different from those of *guerrero* and apparently indistinguishable from those of *allotecnon* populations in Central America. Only with additional material of all stages from Mexico will it be possible to determine the taxonomic status of this population and its relation to *guerrero*. The distribution of *allotecnon* appears to be discontinuous in Central America probably because of its apparent restriction to areas of cloud forest. Although not reported as yet from Guatemala and Honduras, it may occur there in suitable environments.

BIONOMICS. The immature stages of *allotecnon* have been collected in epiphytic bromeliads at elevations above 5,000 feet, frequently in association with members of the Quadrivittatus Group. A few females have been taken in daytime biting-landing collections on human bait.

DISTRIBUTION (fig.6). Cordilleras of Middle America in Mexico (Sierra Madre Oriental and Sierra Madre de Chiapas), possibly eastern Guatemala, El Salvador, probably Honduras, Nicaragua, Costa Rica and Panama (to Canal Zone) at elevations above 5000 ft. Material examined: 521 specimens; 43 ♂, 48 ♀, 136 pupae, 294 larvae; 114 individual rearings (24 pupal, 46 larval, 44 incomplete).

COSTA RICA. *Alajuela*: Poasito, 14 Nov 1962, C.L. Hogue and W.A. Powder (CR 23), 5 lp♀ (23-101,102,104,106,110), 1 p♂ (23-111), 2 p♀ (23-112,113), 3 lP (23-103,107,108), 6 P, 6 p, 7 L, 1 l [UCLA]. Volcan Poas, 14 Apr 1938, H.W. Kumm, 1 ♂; 1 L, 4 l [USNM]; Summit, 14 Nov 1962, C.L. Hogue and W.A. Powder, 1 lp♂ (20-110), 1 lp♀ (20-109), 6 lP (20-102-106,108), 5 L (CR 20), 2 lp♂ (21-103,106), 2 lp♀ (21-109,110), 1 p♂ (21-112), 1 p♀ (21-101), 6 lP (21-102,104, 105,107,109,111), 25 L (CR 21); 9 July 1963, C.L. Hogue, 3 ♂, 2 ♀, 4 P, 4 p, 4 L, 4 l (CR 145) [UCLA]. *Cartago*: Cervantes, 9 Nov 1962, J.N. Belkin, C.L. Hogue and W.A. Powder, 1 L (CR 9), 3 lP (11-101-103), 2 lp♂ (13-104,108), 3 p♂ (13-102,109,110), 3 p♀ (13-101-103), 3 lP (13-103, 105,106), 2 L (CR 13), 7 lp♂ (14-102-105,107,111,112), 2 lp♀ (14-109,110), 1 p♂ (14-101), 1 lP (14-108), 2 L (CR 14); 9 Nov 1962, C.L. Hogue (CR 12), 1 lp♂ (12-106), 1 lP (12-105) [UCLA]. La Sierra, elev. 6300-8500 ft, 24 Nov 1962, C.L. Hogue and W.A. Powder, 1 lP (46-201), 1 lp♂ (49-106), 4 lp♀ (49-104,108-110), 4 lP (49-101-103,105), 1 p, 1 L, 1 l (CR 49), 1 p♂ (51-102), 1 p♀ (51-101), 2 lP (51-104,105), 10 L (CR 51), 2 lp♂ (52-101,109), 1 lp♀ (52-104), 4 lP (52-102, 103,107,110), 21 L (CR 52), 1 lP (53-104), 1 ♀, 15 L (CR 54) [UCLA]. Orosi, 7 Dec 1962, C.L. Hogue and W.A. Powder (CR 83), 1 lp♀ (83-501), 1 L [UCLA]. Rio Macho, 7 Dec 1962, C.L. Hogue and W.A. Powder, 1 lp♀ (79-102), 1 p♂ (79-101), 2 lp♂ (86-103,104), 1 p♂ (86-101), 1 L (CR 86) [UCLA]. Volcan Iraju, 15 Nov 1962, C.L. Hogue and W.A. Powder (CR 24), 2 p♂ (24-101,108), 1 p♀ (24-106), 3 lP (24-102-104), 1 P, 1 l [UCLA]. *Heredia*: Puerto Viejo, 8 Sept 1965, W.J. Hjort (CR 220), 1 lp♂ (220-11) [UCLA]. *San Jose*: Villa Mills, 21 Nov 1962, C.L. Hogue and W.A. Powder (CR 39), 1 lp♀ (39-104), 3 p♀ (39-101-103), 3 L [UCLA].

EL SALVADOR. Laguna de las Ranas, Jan 1942, H.W. Kumm, 4 ♂, 1 ♀, 2 L [USNM].

MEXICO. *Chiapas*: Sumidero Canyon, 17 Aug 1964, E. Fisher and D. Verity, 3 L (MEX 116), 1 ♀ (MEX 121) [UCLA]. *Veracruz*: Cordoba, Fortin de las Flores, 11 July 1964, E. Fisher, 1 ♀ (MEX 14) [UCLA]. Also from states of *Hidalgo, Queretaro* and *San Luis Potosi* (Vargas 1956:22).

NICARAGUA. Jinotega, 3 July 1964, J.N. Belkin and A. Quinonez (NI-33C), 1 lP (33C-41) [UCLA].

PANAMA. *Bocas del Toro*: Chiriquisito, Trail Caldera, 5 Nov 1965, P. Orjuela (PA 1004), 6 ♀ [UCLA]. La Zorra, elev. 4400-5400 ft, 6 Apr 1963, A. Quinonez, 1 L (PA 176); 7 Apr 1963, A. Quinonez, 5 L (PA 179); 8 Apr 1963, A. Quinonez, 4 L, 1 1 (PA 180); 9 Apr 1963, A. Quinonez, 7 L (PA 183) [UCLA]. *Chiriqui*: Palo Santo, elev. 4600 ft, 15 June-1 Dec 1950, 1 ♀ (Trapido, Galindo and Carpenter 1955:530). Boquete, 30 Jan 1914, J. Zetek, 1 ♀ [USNM]. El Hato del Volcan, Chiriqui Lagoon, elev. 4500 ft, 12 Mar 1964, A. Quinonez (PA 638), 2 lp♀ (638-101,102), 1 lP (638-108), 1 L [UCLA]. *Cocle*: El Valle, elev. 2000 ft, 24 Aug 1963, A. Quinonez (PA 533), 1 p♀ (533-101), 2 L [UCLA]. *Panama*: Cerro Campana, 3 Aug 1963, A. Quinonez (PA 462), 1 lp♀ (462-108), 1 p♀ (462-101) [UCLA].

25. Aedes (Howardina) guerrero Berlin, n.sp.

Figs.6,9,49

TYPES: Holotype ♀ (MEX 166), 21 miles south of Chilpancingo, Guerrero, Mexico, 31 Aug 1964, E. Fisher [USNM]. Paratypes: 2 ♀ (MEX 166), same data as holotype [UCLA].

FEMALE. Wing: 3.06 mm. Proboscis: 2.34 mm. Forefemur: 2.16 mm. Abdomen: about 3.15 mm. In general similar to *allotecnon*, differing apparently only in the following. *Head*: Erect scales on occiput whitish in middle, darker on sides. Palpus about 0.2 of proboscis, with white scales on apex and mesal side of segment 4. *Thorax* (fig. 9): Mesonotal light lines golden. Creamy scales on median scutellar lobes narrow distally, broader basally. Paratergite with broad silvery scales. Scales on *apn* broad, silvery; upper *ppn* with predominantly broad, silvery scales, creamy narrow ones restricted to upper border; lower *ppn* patch small, with broad silvery scales; *psp* usually with a small silvery patch; other scale patches bright silvery. *Legs*: Foretarsus and midtarsus with short incomplete white rings on segments 1,2; hindtarsus with broader white rings on 1-3. *Haltere*: Stem pale, knob mostly creamy, with a few black basal scales. *Abdomen*: Basomedian tergal light scales white from segment III caudad, silvery on segments VI,VII. Sternites with broad basal V-shaped white scale patches, silvery on distal segments; apical white scales inconspicuous.

MALE. Unknown.

PUPA. Imperfectly known. Appears very similar to *allotecnon* but possibly differentiated by the hair 5-IV,V which is shorter, barely extending beyond the apex of the following tergite.

LARVA (fig.49). Head: 0.81 mm. Siphon: 0.7 mm. Anal Saddle: 0.3 mm. Readily separated from *allotecnon* by the presence of abdominal spicules only on the ventral surface and anal saddle without distinct marginal spicules ventrad of hair 1-X. *Head*: Width subequal to length. Pigmentation as in *allotecnon*. Mental plate with a strong median tooth and 13(12-14) distinct teeth on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(5, 5-6), 5(1, 1-2), 6(2), 7(2), 8(1), 9(2, 2-4), 10(2, 2-3), 11(7, 5-8), 12(2, 1-2), 13(1), 14(5, 4-8), 15(4, 3-4). *Antenna*: Length about 0.33 of head; shaft pigmentation moderate, spicules not apparent. All hairs except 1 single; 1-A (2) at about 0.6 from base. *Thorax*: Integument glabrous as in *allotecnon*. Apices of long hairs attenuate; barbs present on both long and stellate hairs. Prothorax: hair 0(13, 11-15), 1(6, 3-7), 2(1), 3(13, 10-14), 4(2, 2-3), 5(1, 1-2), 6(2), 7(2), 8(21, 21-25), 9(17, 13-19), 10(1), 11(2, 2-4), 12(1), 13(15, 9-17), 14(34, 30-38). Mesothorax: hair 1(7, 4-7), 2(1), 3(1), 4(1), 5(1), 6(5, 5-6), 7(1), 8(7, 6-7), 9(8, 6-9), 10(1), 11(1), 12(1), 13(14, 10-16), 14(4, 3-7). Metathorax: hair 1(5, 4-6), 2(1), 3(5, 2-6), 4(9, 8-10), 5(9, 8-11), 6(1), 7(7, 6-8), 8(9, 6-11), 9(4), 10(1), 11(1), 12(1), 13(16, 11-17). *Abdomen*: Integument of segment I glabrous; other segments with spinelike spicules restricted to ventral surface; hairs 1,7,13-II-VII apparently not stellate. Segment I: hair 1(7, 4-8), 2(11, 10-15), 3(1), 4(4, 4-5), 5(12, 10-13), 6(3, 3-4), 7(1), 9(6, 5-9), 10(1), 11(11, 10-15), 13(5, 4-7). Segment II: hair 0(1), 1(4, 4-7), 2(9, 8-12), 3(1), 4(4, 4-6), 5(11, 9-12), 6(3, 3-4), 7(5, 4-7), 8(1), 9(5, 5-7), 10(1), 11(1), 12(1), 13(4, 4-5). Segment III: hair 0(1), 1(4, 3-5), 2(11, 8-11), 3(1), 4(1), 5(11, 9-12), 6(2), 7(5, 4-6), 8(1), 9(7, 5-9), 10(1), 11(1), 12(1), 13(4, 3-5), 14(1). Segment IV: hair 0(1), 1(4, 3-5), 2(10, 7-11), 3(1), 4(1), 5(10, 10-13), 6(2), 7(5, 5-7), 8(1), 9(8, 6-8), 10(1), 11(1), 12(1), 13(4, 4-5), 14(1). Segment V: hair 0(1), 1(4, 3-4), 2(8, 8-10), 3(1), 4(1, 1-2), 5(10, 8-11), 6(2), 7(5, 5-8), 8(1), 9(7, 5-9), 10(1), 11(1), 12(1), 13(5, 3-6), 14(1). Segment VI: hair 0(1), 1(3, 3-5), 2(8, 5-9), 3(1), 4(1), 5(9, 6-11), 6(2), 7(4, 3-5), 8(3, 3-4), 9(7, 6-9), 10(1), 11(1), 12(1), 13(5, 4-5), 14(1). Segment VII: hair 0(1), 1(3, 3-4), 2(8, 7-10), 3(1), 4(1), 5(7, 5-9), 6(3, 2-4), 7(1, 1-2), 8(5, 5-7), 9(5, 3-9), 10(1), 11(1), 12(1), 13(4, 3-5), 14(1). *Segment VIII*: Comb scales in a single row, usually 14(12-16) in number; individual scale elongate, pointed apically, evenly fringed almost to tip. Hair 0(1), 1(9, 4-11), 2(1), 3(7, 6-9), 4(1), 5(6, 5-7), 14(1). *Siphon*: Index about 3.3-3.6. Integument imbricate, moderately to strongly pigmented, with darker basal ring. Pecten extending to 0.42, usually with 18(17-22) teeth; individual tooth pointed apically, with basal denticles. Hair 1(3, 2-4), 2(1), 3-5 not visible, 6(1), 7(1), 8(2, 1-2), 9(1). *Anal Segment*: Saddle imbricate, moderately to strongly pigmented, with darker basal ring; caudal margin with spicules present only dorsad of hair 1-X. Gills subequal, long, more than 2.0 of saddle. Hair 1(4, 3-5), 2(5, 5-7), 3(2), 4a(4, 3-5), 4b(3, 3-4), 4c(3, 3-4), 4d(3, 2-3), 4e(2, 1-2).

SYSTEMATICS. Although closely resembling *allotecnon*, this form appears to be a distinct species restricted to the Sierra Madre del Sur in Mexico where no other member of the group has been collected. The association of the immature stages with the females is presumptive only as no adults were obtained from the rearings and were found in a different locality from the adults but is probably correct since the larva is obviously of the *allotecnon* type but with distinctive features as indicated in the diagnosis. The pupal stage is not described at this time as it is known only from 2 whole imperfect specimens from incomplete rearings. It also appears to be generally similar to *allotecnon* but possibly differentiated by the shorter hair 5-IV-V.

BIONOMICS. The presumptive immature stages of *guerrero* have been collected in epiphytic bromeliads at elevations of about 7,200-7,800 feet (MEX 429,430,431, 434). The 3 females were taken in a biting-landing collection (MEX 166) at 0800 in a pine-oak woodland.

DISTRIBUTION (fig.6). Sierra Madre del Sur in Mexico at elevations above 7000 ft. Material examined: 20 specimens; 3 ♀, 2 pupae, 15 larvae; 2 incomplete individual rearings.

MEXICO. *Guerrero*: Chilpancingo, 21.0 mi S, 21 Aug 1964, E. Fisher, 3 ♀ (MEX 166, type series) [USNM, UCLA]. *Oaxaca*: Ixtlan de Juarez, El Punto, elev. 7700 ft, 13 Aug 1966, D.A. Schroeder (MEX 434), 1 lP (434-10); Vivero Rancho Teja, elev. 7200 ft, 12 Aug 1966, D.A. Schroeder, 1 lP (429-10), 7 L (MEX 429), 1 L (MEX 430), 5 L (MEX 431) [UCLA].

26. Aedes (Howardina) guatemala Berlin, n.sp.

Figs.6,9

TYPES: Holotype ♀ (GUA 138-13), Yepocapa, Chimaltenango, Guatemala, 20 July 1950, Miguel Xinic and Pedro Garcia [USNM]. Paratypes: 4 ♀ (GUA 138-10,12,14,15), same data as holotype [UCLA].

FEMALE. Wing: 3.2 mm. Proboscis: 2.37 mm. Forefemur: 2.01 mm. Abdomen: about 2.6 mm. Very similar to *allotecnon*, differing apparently only in the following. *Head*: Erect scales on occiput predominantly dark, median ones lighter. *Thorax* (fig. 9): Mesonotal light lines pale golden. Lateral scutellar lobe with a few narrow dark and pale golden scales. Upper *ppn* scales predominantly creamy, narrow, a few scales slightly broader at lower border. *Legs*: Foretarsus and midtarsus with a few white scales on segment 1; hindtarsus with short white rings on segments 1 and 2 only. *Haltere*: Stem pale, knob predominantly white, dark scales restricted to base.

MALE, PUPA, and LARVA unknown.

SYSTEMATICS. The 6 known females of *guatemala* are so different in the details of ornamentation from other members of the Allotecnon Group that I do not hesitate in recognizing them as members of a distinct species even in the absence of immature stages. This species appears to be restricted to the Pacific slope of central Guatemala where no other species of *Howardina* has been recorded.

BIONOMICS. The immature stages will probably be found in epiphytic bromeliads. The females were probably taken in a biting-landing collection on human bait.

DISTRIBUTION (fig.6). Pacific slope of Guatemala. Material examined: 6 specimens; 6 ♀; no individual rearings or immature stages.

GUATEMALA. *Chimaltenango*: Yepocapa, 20 July 1950, Miguel Xinic and Pedro Garcia (GUA 138, type series), 5 ♀ (138-10,12,13-15); 24 July 1950, V.C. and R. Feoli, 1 ♀ (GUA 139) [USNM, UCLA].

Eleanorae Group

FEMALES. *Head*: Median light line on vertex usually with narrow scales (moderately broad in *eleanorae*). Proboscis distinctly longer than forefemur. Torus with a restricted mesal scale patch. *Thorax*: Mesonotal light lines usually creamy to golden (except in *ecuadoriensis* in which inner dorsocentral and lateral marginal lines are white); inner dorsocentral line complete; outer dorsocentral line usually shorter, not reaching anterior margin, subparallel to inner; lateral marginal line continuous; scales on anterior promontory creamy, golden or white. Antealar area above paratergite with golden scales. Paratergite with a moderate scale patch extending entire sclerite length. Upper *ppn* entirely covered with light scales; upper *stp* patch quadrate. *Legs*: Distal white spot on anterior surface of midfemur distinct; present or absent on hindfemur. Tibiae completely dark. *Wing*: Veins entirely dark scaled. *Abdomen*: Basomedian tergal light markings absent or present on III-VII.

MALES. Palpus with or without basomedian light scales on segments 4 and 5.

MALE GENITALIA. Lobe of tergite IX prominent or indistinct, with 4-7 strong bristles. Sidepieces separated at base by a distance less than width of aedeagus; without any indication of lobes on tergomesal or sternomesal margins. Claspette represented by a conical tubercle. Aedeagus shorter than or subequal to proctiger; apical emargination distinct or shallow, lateral lobes conspicuous or inconspicuous.

PUPAE. *Cephalothorax*: Trumpet moderate, index 4.5-6.4, not expanded apically; hairs 10,12-C varied in branching. *Abdomen*: Hair 5-IV-V moderate to long, sometimes exceeding apex of second tergite following; hair 9-VII moderate, reaching or exceeding lateral angle of tergite. *Paddle*: Moderate; apex usually rounded.

LARVAE. *Head*: Hairs 4-7-C varied in branching; 15-C moderate to long, always extending beyond base of mental plate. *Thorax*: Roundish in outline; spiculation dense, weak or absent, spicules hairlike, simple. *Abdomen*: Integument strongly or weakly uniformly spiculate. Hair 8-VII distinctly cephalodorsad of 9-VII. *Siphon*: Integument smooth or imbricate; acus distinct, separate. *Anal Segment*: Hair 3-X single or double; ventral brush with 5 pairs of hairs.

DISCUSSION. The Eleanorae Group of 6 species is probably derived from the Quadrivittatus Group and seems to replace the Allotecnon Group south of Panama. The ornamentation of the midfemur and hindfemur is quite varied in this group, more or less bridging the characteristic development in the other 2 groups. The larvae are also quite varied and somewhat intermediate between the Quadrivittatus and Allotecnon Groups, although the ventral brush always has only 5 pairs of hairs as in the latter group. Members of this group have been misidentified in the past as *quadrivittatus*.

The Eleanorae Group appears to be entirely confined to the Andes where it has been collected from moderate elevations up to nearly 11,000 feet. The group is now known from western and possibly northcentral Venezuela, Colombia, Ecuador and Bolivia (fig.6). Although seemingly some of the species are found sympatrically, there are indications of strong ecological divergence in other instances (*ecuadoriensis* and *brevivittatus* for example). This group is apparently sympatric to a limited extent with the Whitmorei Group in the north and with the Whitmorei and Aurivittatus Groups in the south.

27. Aedes (Howardina) eleanorae Berlin, n.sp.

Figs.6,9,50,51

TYPES: Holotype ♂ (COB 10-21) with associated pupal and larval skins and genitalia slide, Buritica, Antioquia, Colombia, 5000 ft, 8 Jan 1965, E. Osorno-Mesa [USNM]. Allotype ♀ (COB 10-20) with associated pupal and larval skins, same data as holotype [USNM]. Paratype ♀ (COB 10-22) with associated pupal and larval skins, same data as holotype [UCLA]. This species is dedicated to my wife, Eleanor, for her interests in and contribution to the study of this group.

Aedes (Howardina) quadrivittatus in part of Dyar (1928:229); Edwards (1932:155); Lane (1939:100; 1953:713); Reyes (1955:74,89); Stone, Knight and Starcke (1959:174).

FEMALE. Wing: 3.06 mm. Proboscis: 2.34 mm. Forefemur: 2.07 mm. Abdomen: 2.88 mm. *Head*: Scales on median stripe predominantly broad and white, a few anterior ones narrow; light scales on sides and venter white. Erect scales on occiput and sides creamy. Palpus about 0.16 of proboscis. Mesal light scale patch on torus creamy. *Thorax* (fig.9): All mesonotal light lines creamy, of uniform width throughout; outer dorsocentral line short, arising at anterior 0.25 and reaching scutellum; lateral marginal line long, from side of anterior promontory to wingbase, appearing broad from scutal angle to wingbase owing to presence of creamy scales in antealar area above paratergite; scales on anterior promontory creamy. Median scutellar lobe with broad dark scales laterally and broad creamy scales in the middle from base to apex; lateral lobes with a few narrow creamy scales. Scales on paratergite moderately broad, white. *Apn* scales broad, white, a few anterior ones narrower, creamy; upper *ppn* predominantly with narrow, curved scales, a few broader scales below; lower *ppn* patch distinct and merging with *ssp* patch; other scale patches pure white, distributed as in the group. *Legs*: Forefemur dark anteriorly, predominantly dark posteriorly except for a creamy longitudinal line; midfemur with narrow anteromesal creamy line to 0.67 terminating in a white spot, posteriorly proximal 0.5 creamy, rest dark; hindfemur creamy to 0.67 on both sides, rest dark scaled. Foretarsus with a few white scales on segment 1; midtarsus with short incomplete white ring on 1; hindtarsus with broader white rings on 1 and 3, second segment dark. *Haltere*: Stem pale, knob predominantly white, a few dark scales dorsally. *Abdomen*: Basomedian tergal light scales absent. Sternites with broad V-shaped white patches; apical light scales inconspicuous.

MALE. Wing: 2.88 mm. Proboscis: 2.43 mm. Forefemur: 1.89 mm. Essentially similar to female in color. Palpus entirely dark.

MALE GENITALIA (fig.50). As figured; diagnostic characters as in the key. Ninth tergite lobe not prominent, with 4,5 strong bristles. Sidepiece length about 3.0 of median width. Clasper about 0.5 of sidepiece, with 1,2 subapical hairs; basal 0.3 with minute spicules; spiniform long, about 0.5 of clasper. Aedeagus shorter than proctiger; dorsal sclerotization emarginate apically, producing lateral sclerotized lobes.

PUPA (fig.50). Abdomen: 3.3 mm. Trumpet: 0.39 mm; index 4.4-4.5. Paddle: 0.67 mm. Readily separated from other members of the group (except *leei*) by the strongly developed hair 8-VII on dorsal surface; from *leei* by the branched hair 10-C. Chaetotaxy as given below, hairs moderately to darkly pigmented. *Cephalothorax*: Mesonotum lightly pigmented between trumpets, lateral areas and metanotum darker; trumpet moderately pigmented and sharply contrasting. Hair 1(1), 2(1), 3(1, 1-2), 4(3, 2-5), 5(2), 6(1, 1-2), 7(2), 8(1, 1-3), 9(1, 1-2), 10(6, 5-6), 11(1, 1-2), 12(4, 2-5). *Abdomen*: Tergite I moderately pigmented except for usual membranous areas; II-VII moderately pigmented, progressively lighter caudad. Segment I: hair 1(13-16 primary branches), 2(1, 1-3), 3(1), 4(2, 2-4), 5(1, 1-2), 6(1), 7(1, 1-2), 9(1, 1-3), 11(2, 2-3, present in some). Segment II: hair 0(1), 1(6, 4-7), 2(1), 3(1), 4(2, 2-3), 5(2, 1-2), 6(1), 7(2, 1-3), 9(1), 10 (present in a few). Segment III: hair 0(1), 1(2, 2-4), 2(2, 1-3), 3(1, 1-2), 4(1, 1-2), 5(1, 1-2), 6(1), 7(1, 1-2), 8(1, 1-3), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(2, 2-3), 2(1, 1-2), 3(3, 2-3), 4(1, 1-2), 5(2), 6(1), 7(1, 1-2), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(2), 2(1, 1-2), 3(2, 1-2), 4(2, 2-3), 5(2), 6(1), 7(2, 1-3), 8(2, 1-3), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(2, 1-2), 2(2, 1-2), 3(1, 1-2), 4(2, 1-2), 5(1), 6(1), 7(1, 1-2), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1, 1-2), 2(1, 1-2), 3(1, 1-2), 4(1), 5(1, 1-3), 6(3, 1-3), 7(1), 8(4, 3-5), 9(4, 4-8), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(11, 11-14), 14(1). *Paddle*: Lightly pigmented, midrib slightly darker; hair 1-P single. Male genital lobe extending to 0.5 of paddle, female genital lobe to 0.34.

LARVA (fig.51). Head: 0.63 mm. Siphon: 0.28 mm. Anal Saddle: 0.27 mm. Diagnostic characters as in the key. Readily separated from other members of the group by pecten teeth extending beyond hair 1-S. *Head*: Width subequal to length; pigmentation moderate except around mouthparts where it is deeper. Mental plate with a strong median tooth and usually 12 distinct teeth (11-12) on each side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(12, 9-15), 5(8, 6-9), 6(5, 4-6), 7(17, 14-18), 8(12, 10-14), 9(14, 13-16), 10(2, 2-3), 11(34, 20-42), 12(10, 7-10), 13(1), 14(18, 18-22), 15(2, 2-3). *Antenna*: Length about 0.5 of head; shaft uniformly lightly pigmented and with few scattered spicules; hair 1(3, 2-3), others single. *Thorax*: Integument densely covered with hairlike simple or branched spicules except on intersegmental areas; long hairs barbed and with attenuate apices; stellate hairs with many weakly barbed branches. Prothorax: hair 0(30, 27-34), 1(5, 3-5), 2(1), 3(42, 35-42), 4(2, 1-2), 5(1), 6(1), 7(2), 8(30, 28-34), 9(22, 18-24), 10(1), 11(2, 2-

3), 12(1), 13(36, 31-36), 14(52, 48-62). Mesothorax: hair 1(27, 23-32), 2(1), 3(1), 4(1), 5(1), 6(4, 3-5), 7(1), 8(4, 4-6), 9(5, 5-7), 10(1), 11(1, 1-2), 12(1), 13(22, 18-23), 14(22, 18-26). Metathorax: hair 1(37, 34-40), 2(1), 3(23, 20-26), 4(22, 15-25), 5(21, 17-23), 6(1), 7(4, 4-5), 8(23, 23-35), 9(3, 3-4), 10(1), 11(1, 1-3), 12(1), 13(26, 24-30). *Abdomen*: Integument and stellate hairs as on thorax. Segment I: hair 1(28, 25-28), 2(28, 26-30), 3(1), 4(1), 5(24, 22-25), 6(3, 2-3), 7(1), 9(12, 10-15), 10(1), 11(24, 20-24), 13(30, 29-35). Segment II: hair 0(1), 1(30, 29-31), 2(30, 24-32), 3(1), 4(1), 5(29, 25-30), 6(3), 7(20, 19-29), 8(1), 9(17, 16-17), 10(1), 11(1), 12(1), 13(36, 30-40). Segment III: hair 0(1), 1(30, 28-32), 2(31, 26-34), 3(1), 4(1), 5(28, 25-30), 6(2), 7(22, 17-23), 8(1), 9(22, 21-25), 10(1), 11(1), 12(1), 13(30, 30-33), 14(1). Segment IV: hair 0(1), 1(32, 27-32), 2(29, 26-35), 3(1), 4(1), 5(30, 24-32), 6(2), 7(22, 18-22), 8(1), 9(26, 22-27), 10(1), 11(1), 12(1), 13(28, 26-29), 14(1). Segment V: hair 0(1), 1(28, 28-31), 2(30, 28-33), 3(1), 4(1), 5(30, 23-31), 6(2), 7(22, 16-25), 8(1), 9(26, 25-26), 10(1), 11(1), 12(1), 13(30, 29-33), 14(1). Segment VI: hair 0(1), 1(30, 30-32), 2(28, 28-33), 3(1), 4(1), 5(30, 27-30), 6(1), 7(20, 12-21), 8(1), 9(26, 22-26), 10(1), 11(1), 12(1), 13(26, 23-38), 14(1). Segment VII: hair 0(1), 1(30, 28-33), 2(30, 24-30), 3(1), 4(1), 5(29, 24-29), 6(14), 7(1), 8(24, 20-25), 9(24, 18-24), 10(1, 1-2), 11(1), 12(1), 13(28, 24-28), 14(1). *Segment VIII*: Comb scales in a single row, usually 12(12-14) in number; individual scale long, pointed apically and fringed almost to tip. Hair 0(1), 1(33, 28-34), 2(1), 3(9, 8-9), 4(1), 5(32, 27-35), 14(1). *Siphon*: Index about 3.3; integument imbricate, moderately pigmented except for darker basal ring. Pecten teeth usually 21(19-23), extending beyond hair 1-S to about 0.7 of siphon; individual tooth with basal denticles. Hair 1(4, 3-5), 2(1), 3-5 not visible, 6(1), 7(1), 8(1, 1-2), 9(1). *Anal Segment*: Saddle moderately uniformly pigmented except for darker basal ring; integument with minute spicules; caudal margin with spines of varying length. Gills subequal, moderately long, about 2.0 of saddle length, narrow. Hair 1(2, 2-3), 2(4, 3-4), 3(1), 4a(2), 4b(2), 4c(2), 4d(2), 4e(1).

SYSTEMATICS. *A. eleanorae* is the most strongly differentiated member of the group as indicated in the diagnosis above and in the keys. At present it is known from only 2 localities in Colombia, Buritica in the northern part of the Cordillera Occidental, and Buena Vista in the upper part of the Orinoco basin on the eastern slope of the Cordillera Oriental. Although *eleanorae* may be broadly sympatric with *osornoi* and *marinkellei*, it has not been found associated with these species and apparently occurs at lower elevations.

BIONOMICS. The breeding sites of *eleanorae* are in epiphytic bromeliads at elevations of about 5,000 feet (COB 10). The female from Buena Vista was probably taken in a biting-landing daytime collection.

DISTRIBUTION (fig.6). Upper Magdalena and Orinoco drainages in Colombia. Material examined: 15 specimens; 1 ♂, 3 ♀, 4 pupae, 7 larvae; 3 individual larval rearings).

COLOMBIA. *Antioquia*: Buritica, elev. 5000 ft, 8 Jan 1965, E. Osorno-Mesa (COB 10, type series), 1 lp♂ (10-21), 2 lp♀ (10-20,22); 15 Jan 1965, E. Osorno-Mesa, 1 p, 1 L, 3 l [USNM, UCLA]. *Meta*: Villavicencio, Buena Vista, 4 June 1942, W.H.W. Komp, 1 ♀ [UCLA].

28. Aedes (Howardina) marinkellei Berlin, n.sp.

Figs.6,9,52,53

TYPES: Holotype ♀ with associated pupal and larval skins (COM 63-19), Suba, Bogota, Cundinamarca, Colombia, 8300 ft, 16 Apr 1966, C.J. Marinkelle [USNM]. Paratypes: 1 ♀ (63-15) with associated pupal and larval skins, 7 larvae, same data as holotype [UCLA]. This species is dedicated to Dr. C.J. Marinkelle for his contributions to the study of neotropical mosquitoes.

Aedes (Howardina) quadrivittatus in part of Dyar (1928:229); Edwards (1932:155); Lane (1939: 100; 1953:713); Reyes (1955:74,89); Stone, Knight and Starcke (1959:174).

FEMALE. Wing: 3.85 mm. Proboscis: 3.06 mm. Forefemur: 2.19 mm. Abdomen: about 3.41 mm. Similar to *eleanorae*, differing chiefly in the following. *Head*: Light scales on median stripe and short orbital line narrow, creamy; light scales on sides and venter broad, creamy. Erect scales predominantly creamy, darker on sides. Palpus about 0.16 of proboscis; predominantly dark, apex and mesal surface of segment 4 white scaled. Mesal patch on torus creamy. *Thorax* (fig.9): All mesonotal light lines creamy; outer dorsocentral line complete, broader on anterior 0.5, merging with lateral marginal line at level of lateral prescutal area; lateral marginal line long, moderately broad, extending from area of humeral bristle to wingbase; scales on anterior promontory creamy. Light scales on median scutellar lobe broad, white from base to apex; lateral lobes with a few narrow dark scales. Scales on paratergite moderately broad, creamy. *Apn* scales predominantly broad, dingy white, a few anterior ones narrower; *ppn* with only an upper patch of predominantly narrow creamy scales, a few lower ones whitish, broader; upper *stp* patch larger than in *eleanorae*; other scale patches white, distributed as in *eleanorae*. *Legs*: Forefemur predominantly dark anteriorly except for a few scattered whitish scales along whole length, posterior surface mostly creamy except for a narrow dark line from base to apex; midfemur predominantly dark anteriorly except for a few basal creamy scales and a white spot at distal 0.67, posteriorly mostly creamy with scattered dark scales on distal 0.5; hindfemur creamy to 0.67 on both sides, rest dark scaled. Foretarsus and midtarsus with basal white scales on segments 1,2; hindtarsus with broader white rings on segments 1-3. *Haltere*: Stem whitish, knob predominantly white, a few basal scales dark. *Abdomen*: Basomedian tergal light scales dingy white. Sternites with large basal patches of dingy white scales; median apical white scales distinct to VI, on segment VII few and indistinct. Cercus with a few apical white scales.

MALE unknown.

PUPA (fig.52). Abdomen: 4.6 mm. Trumpet: 0.51 mm; index about 4.5. Paddle: 0.86 mm. Chaetotaxy as given below, hairs moderately to darkly pigmented. Distinguished from *osornoi* by metanotal hairs all single, from *leei* and *eleanorae* by ventrally placed hair 8-VII. *Cephalothorax*: Mesonotum moderately pigmented between trumpets, lateral areas and metanotum darker; trumpets strongly contrasting. Hair 1(1), 2(1), 3(1), 4(3), 5(2), 6(1), 7(2, 2-3), 8(1), 9(1), 10(1), 11(1), 12(1). *Abdomen*: Tergite I moderately pigmented except for usual membranous areas; rest of segments moderate, pigmentation progressively lighter caudad. Segment I: hair 1(6-7 primary branches, each with many secondary ones), 2(1), 3(1), 4(2, 1-2), 5(2), 6(1), 7(1), 9(1), 11(1). Segment II: hair 0(1), 1(2, 1-2), 2(1), 3(1), 4(1), 5(1), 6(1), 7(1), 9(1). Segment III: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1, 1-2), 5(1), 6(1), 7(1, 1-2), 8(1), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(1, 1-2), 2(1), 3(2), 4(2, 1-2), 5(2), 6(1), 7(1, 1-2), 8(1), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1), 5(1), 6(1), 7(2), 8(1), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(1), 7(1), 8(1), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(1), 7(1), 8(1), 9(2), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(5, 5-7), 14(1). *Paddle*: Uniformly lightly pigmented, midrib darker; external margin serrated; apex rounded; hair 1-P slender. Female genital lobe extending to 0.31 of paddle.

LARVA (fig.53). Head: 0.93 mm. Siphon: 0.81 mm. Anal Saddle: 0.32 mm. Chaetotaxy as given below, hairs moderately to darkly pigmented. Readily separated from all other members of Eleanorae Group by hair 5-C always double. *Head*: Width subequal to length; pigmentation moderate except around mouthparts where it is deeper. Mental plate with a strong median tooth and 10,11 distinct teeth on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(6, 5-6), 5(2), 6(3, 3-4), 7(5, 4-6), 8(1), 9(2, 2-4), 10(2), 11(12, 8-12; stellate, branches of varied lengths), 12(1), 13(1), 14(6, 4-8), 15(2). *Antenna*: Length about 0.33 of head; pigmentation moderate; shaft with scattered spicules. All hairs except 1 single; hair 1-A (2, 2-3) at about 0.58 from base. *Thorax*: Integument sparsely covered with simple, hairlike spicules. Apices of long hairs attenuate; long and stellate hairs weakly barbed. Prothorax: hair 0(17, 13-22), 1(3), 2(1), 3(20, 19-22), 4(2, 1-2), 5(1), 6(1), 7(2), 8(15, 10-16), 9(11, 9-13), 10(1), 11(1, 1-3), 12(1), 13(17, 16-20), 14(34, 34-38). Mesothorax: hair 1(7, 6-8), 2(1), 3(1), 4(1), 5(1), 6(4, 3-5), 7(1), 8(6, 5-6), 9(6, 4-8), 10(1), 11(1), 12(1), 13(10, 8-11), 14(2, 1-3). Metathorax: hair 1(9, 6-9), 2(1), 3(3, 2-4), 4(9, 8-10), 5(10, 7-10), 6(1), 7(6, 5-7), 8(9, 8-10), 9(3), 10(1), 11(1), 12(1), 13(12, 10-18). *Abdomen*: Integument and stellate hairs as in thorax. Segment I: hair 1(13, 11-19), 2(8, 8-11), 3(1), 4(1), 5(10, 9-16), 6(3, 2-3), 7(1), 9(2, 2-3), 10(1), 11(13, 11-14), 13(6, 4-8). Segment II: hair 0(1), 1(16, 12-16), 2(9, 8-11), 3(1), 4(1), 5(10, 8-12), 6(3), 7(6, 5-6), 8(1), 9(6, 5-7), 10(1), 11(1), 12(1), 13(9, 8-10). Segment III: hair 0(1), 1(15, 11-16), 2(10, 10-12), 3(1), 4(1), 5(13, 11-14), 6(2), 7(8, 7-10), 8(1), 9(11, 6-11), 10(1), 11(1), 12(1), 13(11, 8-12), 14(1). Segment IV: hair 0(1), 1(15, 13-17), 2(12, 9-13), 3(1), 4(1), 5(12, 10-13), 6(2), 7(9, 7-10), 8(1), 9(11, 9-13), 10(1), 11(1), 12(1), 13(11, 8-12), 14(1). Segment V: hair 0(1), 1(14, 12-16), 2(10, 10-13), 3(1), 4(1), 5(12, 9-13), 6(2), 7(9, 6-9), 8(1), 9(11, 11-15), 10(1), 11(1), 12(1), 13(10, 9-11), 14(1). Segment VI: hair 0(1), 1(14, 11-16), 2(10, 9-12), 3(1), 4(1), 5(11, 10-13), 6(2), 7(5, 5-8), 8(1), 9(12, 10-14), 10(1), 11(1), 12(1), 13(9, 7-9), 14(1). Segment VII: hair 0(1), 1(10, 9-15), 2(10, 10-13), 3(1), 4(1), 5(10, 8-11), 6(5, 4-6), 7(1), 8(5, 5-6), 9(8, 5-10), 10(1), 11(1), 12(1), 13(5, 4-6), 14(1). *Segment VIII*: Comb scales in a single row, usually 14(14-18) in number; individual scale long, pointed apically, fringed nearly to tip. Hair 0(1), 1(7, 7-11), 2(1), 3(5, 3-6), 4(1), 5(6, 6-9), 14(1). *Siphon*: Index about 3.0-3.2; moderately pigmented, imbricate. Pecten extending to about 0.5, usually with 16(16-19) teeth; individual tooth with basal denticles. Hair 1(1, 1-2), 2(1), 3-5 not visible, 6(1), 7(1), 8(1), 9(1). *Anal Segment*: Saddle moderately pigmented, with darker basal ring; caudal margin with spines of varying sizes. Gills subequal, at least 3.0 of saddle length, fingerlike. Hair 1(1), 2(4, 3-4), 3(2, 2-3), 4a(2, 2-3), 4b(2), 4c(2, 1-2), 4d(2, 1-2), 4e(2).

SYSTEMATICS. *A. marinkellei* is most similar to *osornoi* and *leei* but is readily separated from both by constant diagnostic features in all known stages. It is known at present only from Cundinamarca Province in Colombia at elevations of over 8,000 feet where it is sympatric with *osornoi*. As indicated under the latter, a single reared female from this area combines features of *osornoi* in adult ornamentation and of *marinkellei* in the immature stages, suggesting hybridization between the 2 forms. Although found in the same general locality, *osornoi* and *marinkellei* have not been collected together in the same bromeliad axils. It appears, therefore, that some ecological barrier usually separates the 2 species.

BIONOMICS. Immature stages of *marinkellei* have been found in the axils of epiphytic bromeliads at elevations above 8,000 feet. Judging by the adult collection, females of this species are apparently at least occasionally attracted to humans.

DISTRIBUTION (fig.6). Cordillera Oriental in Colombia. Material examined: 22

specimens; 11 ♀, 2 pupae, 9 larvae; 2 larval individual rearings.

COLOMBIA. *Cundinamarca*: Bogota, 1918, Fr. Apollinaire-Marie, 1 ♀; B.G. Amortegui, 1 ♀ [USNM]. Rio San Francisco, 21 May 1942, W.H.W. Komp, 7 ♀ [USNM, UCLA]. Suba, elev. 8300 ft, 16 Apr 1966, C.J. Marinkelle (COM 63, type series), 2 lp♀ (63-15,19), 7 L [USNM, UCLA].

29. Aedes (Howardina) leei Berlin, n.sp.

Figs.6,9,54,55

TYPES: Holotype ♀ (COL 17), 17.5 miles S.E. of Purace, Huila, Colombia, 10,000 ft, 28 Oct 1964, V.H. Lee [USNM]. Paratypes: 32 ♀ (COL 17), same data as holotype [USNM, BM, UCLA]. This species is dedicated to Dr. V.H. Lee, in recognition of his contributions to the study of neotropical mosquitoes.

Aedes (Howardina) quadrivittatus of Martinez and Prosen (1953:28,30; 1955:33-35; 1959:603, 605); Martinez, Carcavallo and Prosen (1960:25); Reyes (1955:74,89); Prosen, Carcavallo and Martinez (1964:105).

FEMALE. Wing: 5.04 mm. Proboscis: 3.15 mm. Forefemur: 2.88 mm. Abdomen: about 4.32 mm. Similar to *eleanorae* but larger and differing primarily in the following. *Head*: Light scales on median stripe and short orbital line narrow, pale golden; light scales on sides and venter creamy. Erect scales dull creamy. Palpus about 0.17 of proboscis; predominantly dark, apex and mesal surface of segment 4 creamy. Mesal patch on torus creamy. *Thorax* (fig.9): All mesonotal light lines golden; outer dorsocentral line incomplete, extending from anterior 0.25 to scutellum; lateral marginal line long, extending from side of anterior promontory to wingbase; scales on anterior promontory golden. Light scales on median scutellar lobe narrow, golden; lateral lobes with a few narrow dark scales. Scales on paratergite broad, creamy. *Apn* scales predominantly broad, creamy, a few anterior ones narrower, pale golden; *ppn* with only an upper patch of predominantly narrow golden scales; a few lower ones broader; other patches dingy white, distributed as in *eleanorae*. *Legs*: Forefemur dark anteriorly except for basal creamy scales, posterior surface with a creamy line broad to 0.5, narrowed distally, rest dark; midfemur mostly dark anteriorly except for basal creamy scales and a dingy white spot at distal 0.67, posteriorly proximal 0.6 creamy, rest dark; hindfemur creamy to 0.67 on both sides, rest dark scaled. Foretarsus with a few white scales on segment 1; midtarsus with short incomplete white rings on 1,2; hindtarsus with broader white rings on segments 1-3. *Haltere*: Stem pale, knob mostly dark, fringe scales whitish. *Abdomen*: Basomedian tergal light scales distinct; dingy white on segments II-VI, white on VII. Sternites with basal creamy patch; VI,VII with subapical band of white scales; apical light scales inconspicuous.

MALE. Wing: 5.04 mm. Proboscis: 3.69 mm. Forefemur: 2.7 mm. Essentially similar to female in color. Palpus predominantly dark, with basoventral white scales on segments 4 and 5.

MALE GENITALIA (fig.54). As figured; diagnostic characters as in the key. Ninth tergite lobe prominent, with 5,6 strong setae. Sidepiece length about 3.0 of median width. Clasper about 0.62 of sidepiece, with 2,3 subapical hairs; spiniform short, about 0.25 of clasper. Aedeagus subquadrate, longer than proctiger; dorsal sclerotization emarginate, producing lateral apical sclerotized lobes.

PUPA (fig.54). Abdomen: 4.12 mm. Trumpet: 0.63 mm; index about 5.3. Paddle: 0.99 mm. Diagnostic characters as in the key. Chaetotaxy as given below, hairs moderately to darkly pigmented. Readily distinguished from *eleanorae* and *osornoi* by all metanotal hairs single; from *marinkellei* by dorsally placed hair 8-VII. *Cephalothorax*: Mesonotum moderately pigmented between trumpets, lateral areas and metanotum darker; trumpets strongly contrasting. Hair 1(1), 2(1), 3(1), 4(2, 2-3), 5(2), 6(1), 7(1, 1-2), 8(1), 9(1), 10(1), 11(1), 12(1). *Abdomen*: Tergite I strongly pigmented except for usual membranous areas; rest of segments with moderate to strong pigmentation, progressively lighter caudad. Segment I: hair 1(9-12 primary branches, each with many secondary ones), 2(1), 3(1), 4(1, 1-2), 5(1, 1-2), 6(1), 7(1), 9(1). Segment II: hair 0(1), 1(2, 1-3), 3(1, 1-2), 4(2), 5(1), 6(1), 7(1), 8(1), 9(1). Segment III: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(2), 6(1), 7(1, 1-2), 8(1), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(1, 1-3), 2(1), 3(1, 1-2), 4(1), 5(2), 6(1), 7(1, 1-2), 8(1), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(2), 6(1), 7(2), 8(1), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(2), 3(1), 4(1), 5(1), 6(1), 7(1), 8(1), 9(1, 1-2), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1, 1-2), 2(1), 3(1), 4(1), 5(1), 6(2, 1-2), 7(1), 8(1), 9(4, 2-4), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1), 9(7, 6-7), 14(1). *Paddle*: Uniformly moderately pigmented, midrib darker; external margin serrated; apex faintly emarginate; hair 1-P slender. Male genital lobe extending to 0.44 of paddle, female genital lobe to 0.31.

LARVA (fig.55). Head: 0.94 mm. Siphon: 1.05 mm. Anal Saddle: 0.28 mm. Diagnostic characters as in the key. Chaetotaxy as given below; hairs moderately to darkly pigmented. Readily separated from *marinkellei* by hair 5-C single; from *osornoi* by hair 3-X double; from *eleanorae* by pecten teeth terminating before hair 1-S. *Head*: Width subequal to length; pigmentation strong except around mouthparts where it is deeper. Mental plate with a strong median tooth and usually 12(12-14) distinct teeth on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(7, 4-7), 5(1, 1-2), 6(3, 2-3), 7(4, 4-5), 8(1, 1-2), 9(3), 10(3, 2-3), 11(16, 10-16, stellate, branches of varying length), 12(1), 13(1), 14(15, 10-19), 15(1, 1-2). *Antenna*: Length about 0.38 of head; pigmentation strong; shaft with a few scattered spicules. All hairs except 1, single; hair 1-A (2, 2-3) at about 0.64 from base. *Thorax*: Integument weakly spiculate, spicules hairlike. Apices of long hairs attenuate; barbs present on long and stellate hairs. Prothorax: hair 0(26, 26-44), 1(2, 1-2), 2(1), 3(44, 34-72), 4(1, 1-2), 5(1), 6(1), 7(2), 8(24, 23-36), 9(24, 13-34), 10(1), 11(1, 1-3), 12(1), 13(34, 29-51), 14(36, 36-50). Mesothorax: hair 1(20, 9-32), 2(1), 3(1), 4(1), 5(1), 6(5, 4-6), 7(1), 8(6, 3-8), 9(7, 6-8), 10(1), 11(1), 12(1), 13(18, 15-29), 14(13, 3-21). Metathorax: hair 1(26, 21-44), 2(1), 3(4, 3-5), 4(18, 16-30), 5(16, 14-20), 6(1), 7(5, 3-7), 8(16, 14-20), 9(3), 10(1), 11(1, 1-2), 12(1), 13(26, 20-46). *Abdomen*: Integument and stellate hairs as on thorax. Segment I: hair 1(22, 21-40), 2(27, 17-37), 3(1), 4(1), 5(14, 10-26), 6(2, 2-3), 7(1), 9(1, 1-2), 10(1), 11(20, 17-36), 13(19, 14-24). Segment II: hair 0(1), 1(22, 19-45), 2(23, 17-46), 3(1), 4(1), 5(16, 11-26), 6(3, 2-3), 7(11, 9-17), 8(1), 9(9, 8-20), 10(1), 11(1), 12(1), 13(18, 16-23). Segment III: hair 0(1), 1(22, 22-50), 2(22, 18-47), 3(1), 4(1), 5(15, 14-32), 6(1, 1-2), 7(11, 8-20), 8(1), 9(20, 16-34), 10(1), 11(1), 12(1), 13(25, 16-36), 14(1). Segment IV: hair 0(1), 1(24, 21-49), 2(22, 20-47), 3(1), 4(1), 5(16, 13-31), 6(1, 1-2), 7(10, 9-18), 8(1), 9(22, 18-33), 10(1), 11(1), 12(1), 13(25, 18-40), 14(1). Segment V: hair 0(1), 1(20, 18-46), 2(22, 18-45), 3(1), 4(1), 5(18, 14-26), 6(1), 7(10, 8-19), 8(1), 9(18, 16-31), 10(1), 11(1), 12(1), 13(24, 17-41), 14(1). Segment VI: hair 0(1), 1(24, 22-40), 2(22, 20-40), 3(1), 4(1), 5(16, 11-24), 6(1), 7(8, 8-16), 8(1), 9(20, 18-31), 10(1), 11(1), 12(1), 13(16, 12-16), 14(1). Segment VII: hair 0(1), 1(24, 18-27), 2(18, 16-27), 3(1), 4(1), 5(16, 12-19), 6(8, 8-11), 7(1), 8(10, 10-14), 9(17, 15-21), 10(1), 11(1), 12(1), 13(15, 13-15), 14(1). *Segment VIII*: Comb scales in a single row, usually 14(12-15) in number; individual scale long, pointed apically, fringed nearly to tip. Hair 0(1), 1(24, 19-24), 2(1), 3(7, 6-8), 4(1), 5(19, 11-21), 14(1). *Siphon*: Index about 3.8-4.3; integument imbricate, strongly pigmented, with darker basal ring. Pecten extending to about 0.5, usually 23(22-24) teeth; individual tooth with basal denticles. Hair 1(3, 2-3), 2(1), 3-5 not visible, 6(1), 7(1), 8(1), 9(1). *Anal Segment*: Saddle strongly pigmented, with darker basal ring; caudal margin with spines of varying sizes. Gills subequal, fingerlike, about 2.0 of saddle length. Hair 1(3, 2-4), 2(4, 3-5), 3(2), 4a(2), 4b(2), 4c(2), 4d(2), 4e(2, 1-2).

SYSTEMATICS. *A. leei* appears to be closely related to *osornoi* and *marinkellei*. It is sharply differentiated ecologically from the other 2 species, occurring apparently at considerably higher elevations in the paramo. All the stages are known from the type locality of Paramo de Purace in southern Colombia at elevations of 9600-10,500 ft (COL 16,17,19,52,53,54). The only other definite record is a single female from Zongo near La Paz, Bolivia. It seems very probable that this species will eventually be found in the intermediate area in Ecuador and Peru.

BIONOMICS. The immature stages have been collected in epiphytic and terrestrial bromeliads in the Paramo de Purace where a number of females were also taken biting-landing and entering a car between 1715 and 1815 hrs.

DISTRIBUTION (fig.6). Paramo in southern Colombia and Bolivia, above 9000 ft. Material examined: 188 specimens; 1 ♂, 34 ♀, 31 pupae, 122 larvae; 6 individual rearings (2 pupal, 4 incomplete).

BOLIVIA. *Cochabamba*: Chapare, Yungas del Palmar, elev. 3200 m, 1 ♀ (Prosen, Carcavallo and Martinez 1964:104). *La Paz*: Zongo, 1 Apr 1946, W.H.W. Komp, 1 ♀ [USNM].

COLOMBIA. *Cauca*: Paramo de Purace, 9600-10,500 ft, 18 Feb 1965, V.H. Lee (COL 52), 1 p♀ (52-101), 4 lP (52-18,19,29,36), 8 P, 38 L; 19 Feb 1965, V.H. Lee, 7 L (COL 53), 5 P, 36 L (COL 54) [UCLA]. *Huila*: 10.0-17.5 mi S.E. of Purace, 9600-10,500 ft, 28 Oct 1964, V.H. Lee, 1 p♂ (16-100), 33 ♀ (COL 17, type series); 30 Oct 1964, V.H. Lee, 9 P, 25 L, 1 l (COL 19), 3 P, 11 L (COL 20) [USNM, BM, UCLA].

30. Aedes (Howardina) osornoi Berlin, n.sp.

Figs.6,9,56,57

TYPES: Holotype ♂ (COB 37-16) with associated pupal and larval skins and genitalia slide, "Chorro de Padilla," Rio San Francisco, Bogota, Cundinamarca, Colombia, elev. 8200 ft, 14 July 1965, J.A. Ochoa [USNM]. Allotype ♀ (COB 37-10) with associated pupal and larval skins, same data as holotype [USNM]. Paratypes: 2 ♂ (COB 37-11,12), 2 ♀ (37-17,18), with associated pupal and larval skins, same data as holotype [BM, UCLA]. This species is dedicated to Dr. E. Osorno-Mesa, in recognition of his important contributions to the knowledge of neotropical mosquitoes.

Aedes (Howardina) quadrivittatus in part of Dyar (1928:229); Edwards (1932:155); Lane (1939: 100; 1953:713); Reyes (1955:74,89); Stone, Knight and Starcke (1959:174); Cova Garcia, Sutil and Rausseo (1966a:58,283; 1966b:12,141,171,334).

FEMALE. Wing: 3.8 mm. Proboscis: 3.24 mm. Forefemur: 2.34 mm. Abdomen: about 3.8 mm. Similar to *eleanorae* but generally larger and differing mainly in the following. *Head*: Light scales on median stripe and short orbital line narrow, pale golden; light scales on sides and venter creamy. Erect scales predominantly pale golden, a few on sides darker. Palpus about 0.15 of proboscis; predominantly dark, with white scales on apex and mesal surface of segment 4. Mesal scale patch on torus creamy. *Thorax* (fig.9): All mesonotal light lines golden; outer dorsocentral line joined anteriorly to entire lateral prescutal area in fossa, gradually narrowed caudad to scutellum; lateral marginal line separate only from scutal angle to wingbase; scales on anterior promontory golden. Light scales on median scutellar lobe predominantly narrow, pale golden, a few basal ones broader; lateral lobe with a few narrow dark and creamy scales. Scales on paratergite golden, moderately broad. *Apn* scales predominantly broad, pale golden, but a few anterior scales narrower; *ppn* only with an upper patch of narrow golden scales; *psp* scales narrow, pale golden; other patches pure white and distributed as in *eleanorae*. *Legs*: Forefemur predominantly dark anteriorly except for a few basal creamy scales, posterior surface mostly dark except for creamy longitudinal line from base to apex; midfemur dark anteriorly except for a few basal creamy scales and a dingy white spot at about 0.5, posterior surface creamy in basal 0.5 and along a narrow distal line, rest dark; hindfemur creamy in basal half. Foretarsus with white scales on segments 1,2; midtarsus with short incomplete white rings on 1,2, occasionally a few white scales on 3; hindtarsus with broader white rings on 1-3. *Haltere*: Stem pale, knob predominantly creamy, a few dorsal scales dark. *Abdomen*: Basomedian tergal light scales absent. Sternites with broad basal V-shaped silvery white patches; apical white scales inconspicuous.

MALE. Wing: 4.5 mm. Proboscis: 3.24 mm. Forefemur: 2.16 mm. Essentially similar to female in color. Palpus entirely dark.

MALE GENITALIA (fig.56). As figured; diagnostic characters as in the key. Ninth tergite lobe prominent, with 5-7 strong setae. Sidepiece length 2.5-3.0 of median width. Clasper about 0.67 of sidepiece, with 2 subapical hairs; spiniform moderate, length about 0.33 of clasper. Aedeagus subquadrate, shorter than proctiger; dorsal sclerotization shallowly emarginate, lateral lobes inconspicuous.

PUPA (fig.56). Abdomen: 4.29 mm. Trumpet: 0.61 mm; index 6.3-6.4. Paddle: 0.94 mm. Chaetotaxy as given below, hairs moderately to darkly pigmented. Distinguishable from *leei* and *marinkellei* by hairs 10,12-C branched; from *eleanorae* by the ventrally placed hair 8-VII. *Cephalothorax*: Mesonotum lightly pigmented between trumpets; lateral areas and metanotum slightly darker; trumpets strongly contrasting. Hair 1(1), 2(1), 3(1), 4(3, 1-4), 5(2, 1-3), 6(1, 1-2), 7(2, 1-3), 8(2, 1-3), 9(1), 10(3, 1-4), 11(1), 12(2, 1-4). *Abdomen*: Tergite I moderately pigmented except for usual membranous areas; tergites II,III also moderately pigmented, distal segments progressively lighter caudad. Segment I: hair 1(12-21 primary branches, subequal in length and each with a few branches), 2(1, 1-3), 3(1), 4(2, 2-3), 5(2, 1-3), 6(1), 7(1), 9(1), 11(1, 1-2 only occasionally present). Segment II: hair 0(1), 1(9, 3-19), 2(1, 1-2), 3(1), 4(2, 1-3), 5(1, 1-2), 6(1), 7(1, 1-2), 8(1, 1-2), 9(1). Segment III: hair 0(1), 1(3, 2-5), 2(1, 1-3), 3(1, 1-2), 4(1, 1-2), 5(1, 1-2), 6(1), 7(2, 1-2), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment IV: hair 0(1), 1(2, 1-2), 2(1, 1-2), 3(3, 2-3), 4(1), 5(2, 2-3), 6(1), 7(2, 1-2), 8(1, 1-2), 9(1), 10(1), 11(1), 14(1). Segment V: hair 0(1), 1(1), 2(1, 1-3), 3(1), 4(2, 1-2), 5(2, 1-2), 6(1), 7(2, 1-3), 8(2, 1-2), 9(1), 10(1), 11(1), 14(1). Segment VI: hair 0(1), 1(1), 2(1, 1-2), 3(1), 4(1, 1-2), 5(1, 1-2), 6(1), 7(1, 1-2), 8(2, 1-3), 9(1), 10(1), 11(1), 14(1). Segment VII: hair 0(1), 1(1), 2(1), 3(1), 4(1), 5(1), 6(2, 1-2), 7(1), 8(2, 1-3), 9(3, 2-4), 10(1), 11(1), 14(1). Segment VIII: hair 0(1), 4(1, 1-3), 9(8, 5-9), 14(1, 1-2). *Paddle*: Uniformly lightly pigmented, midrib darker; external margin serrated and apex rounded; hair 1-P slender. Male genital lobe extending to about 0.47 of paddle, female genital lobe to 0.3.

LARVA (fig.57). Head: 0.99 mm. Siphon: 0.91 mm. Anal Saddle: 0.33 mm. Readily separated from other members of the group by hair 3-X single. Chaetotaxy as given below. *Head*: Width subequal to length; pigmentation moderate except around mouthparts where it is deeper. Mental plate with a strong median tooth and 11 distinct teeth on either side, often a smaller detached tooth at base. Hair 0(1), 1(1), 3(1), 4(6, 4-8), 5(1), 6(3, 3-4), 7(4, 4-5), 8(1), 9(2, 1-2), 10(1), 11(16, 9-16), 12(1), 13(1), 14(12, 7-16), 15(1, 1-2). *Antenna*: Length about 0.33 of head; pigmentation light, shaft with a few scattered spicules. All hairs except 1 single; hair 1-A (2, 2-3) about 0.64 from base. *Thorax*: Integument glabrous. Apices of long hairs attenuate; stellate hairs with unequal, weakly barbed, spikelike branches. Prothorax: hair 0(28, 24-33), 1(2), 2(1, 1-2), 3(31, 27-36), 4(1), 5(1), 6(1), 7(2), 8(26, 20-29), 9(16, 15-21), 10(1), 11(2, 2-3), 12(1), 13(30, 29-37), 14(41, 38-45). Mesothorax: hair 1(22, 18-25), 2(1), 3(1), 4(1), 5(1), 6(4, 3-4), 7(1), 8(5, 4-6), 9(5, 4-7), 10(1), 11(1, 1-2), 12(1), 13(18, 13-20), 14(13, 11-15). Metathorax: hair 1(25, 23-37), 2(1), 3(16, 12-16), 4(3, 3-8), 5(16, 14-19), 6(1), 7(4, 3-4), 8(16, 15-16), 9(3, 3-4), 10(1), 11(1, 1-2), 12(1), 13(20, 18-23). *Abdomen*: Integument weakly spiculate, spicules simple, hairlike; stellate hairs as on thorax. Segment I: hair 1(18, 18-21), 2(17, 16-22), 3(1), 4(1), 5(16, 13-18), 6(3, 2-3), 7(1), 9(6, 4-6), 10(1), 11(16, 15-18), 13(16, 15-18). Segment II: hair 0(1), 1(20, 17-22), 2(20, 16-20), 3(1), 4(1), 5(16, 14-18), 6(2, 2-3), 7(12, 10-12), 8(1), 9(6, 6-9), 10(1), 11(1), 12(1), 13(24, 21-24). Segment III: hair 0(1), 1(18, 18-22), 2(17, 17-20), 3(1), 4(1), 5(16, 13-20), 6(1), 7(11, 10-13), 8(1), 9(14, 11-14), 10(1), 11(1), 12(1), 13(23, 21-28), 14(1). Segment IV: hair 0(1), 1(21, 19-24), 2(20, 16-22), 3(1), 4(1), 5(17, 16-19), 6(1, 1-2), 7(11, 10-13), 8(1), 9(15, 14-18), 10(1), 11(1), 12(1), 13(22, 18-25), 14(1). Segment V: hair 0(1), 1(21, 19-22), 2(20, 17-22), 3(1), 4(1), 5(17, 16-19), 6(2, 1-2), 7(10, 10-14), 8(1), 9(17, 14-20), 10(1), 11(1), 12(1), 13(22, 20-25), 14(1). Segment VI: hair 0(1), 1(21, 19-21), 2(22, 17-24), 3(1), 4(1), 5(16, 14-18), 6(1), 7(12, 10-14), 8(1), 9(16, 14-19), 10(1), 11(1), 12(1), 13(24, 22-26), 14(1). Segment VII: hair 0(1) 1(22, 20-24), 2(20, 18-22), 3(1, 1-2), 4(1), 5(18, 17-21), 6(9, 9-11), 7(1), 8(17, 14-19), 9(16, 14-17), 10(1), 11(1), 12(1), 13(24, 20-27), 14(1). *Segment VIII*: Comb scales in a single row, usually 16(14-16) in number; individual scale long, pointed apically, fringed nearly to tip. Hair 0(1), 1(24, 21-26), 2(1), 3(6, 5-7), 4(1), 5(24, 18-24), 14(1, 1-2). *Siphon*: Index about 3.3-3.67; integument moderately pigmented, with darker basal ring. Pecten extending to about 0.42-0.5, usually 18(16-22) teeth; individual tooth with basal denticles. Hair 1(4, 3-4), 2(1), 3-5 not visible, 6(1), 7(1), 8(2, 1-4), 9(1). *Anal Segment*: Saddle moderately pigmented, with a darker basal ring; caudal margin with spines of varying sizes. Gills subequal, more than 2.0 of saddle length. Hair 1(2), 2(4, 3-4), 3(1), 4a(2, 2-3), 4b(2), 4c(2), 4d(2, 1-2), 4e(1, 1-2).

SYSTEMATICS. *A. osornoi* is readily separated from its apparent nearest relatives, *marinkellei* and *leei*, by constant diagnostic features in all known stages. Immature stages and females are known only from elevations above 8,000 feet in Cundinamarca Province, Colombia, in the central part of the Cordillera Oriental. A female collected at 9,000 feet in the Sierra Nevada of the Cordillera de Merida in Venezuela [USNM] is undoubtedly *osornoi* and it seems very likely that the record of *quadrivittatus* from Aragua in the Cordillera de la Costa (Cova Garcia, Sutil and Rausseo 1966) also pertains to this species. In the fair sample of material no striking variation is apparent except for 1 reared female from Cundinamarca Province (COB 37-13) where *osornoi* is sympatric with *marinkellei*. In this specimen a suggestion of possible hybridization or introgression of these 2 species is indicated in the *osornoi*-like ornamentation of the adult and in the resemblance of the immature stages to *marinkellei*. In this area of sympatry, the 2 species have not been collected together in the same bromeliad axils, suggesting an ecological barrier of some kind between them.

BIONOMICS. The known breeding sites of *osornoi* are epiphytic bromeliads at elevations above 8,000 feet. As in the case of *marinkellei*, several females have been taken, probably in biting-landing collections, at human bait.

DISTRIBUTION (fig.6). Colombia (Cordillera Oriental) and Venezuela (Cordillera de Merida and probably Cordillera de la Costa) at elevations of 8000-9000 ft. Material examined: 114 specimens; 11 ♂, 45 ♀, 22 pupae, 36 larvae; 22 individual rearings (20 larval, 2 incomplete).

COLOMBIA. *Cundinamarca*: Bogota, B.G. Amortegui, 5 ♀ [USNM]. Puerto Lievano and Bogota, 6 Aug 1935, B.G. Amortegui, 9 ♀ [USNM]. Rio San Francisco, 21 May 1942, W.H.W. Komp, 7 ♀ [USNM]; "Chorro de Padilla," elev. 8000 ft, 9 Feb 1965, E. Ruiz, 1 lp♂ (11-10), 1 lp♀ (11-11), 3 l (COB 11), 12 ♀, 10 L (COB 650209); 25 Feb 1965, E. Ruiz, 2 l (COB 14); 21 June 1965, J.A. Ochoa (COB 34), 3 lp♂ (34-18,93,94), 5 lp♀ (34-14-17,19), 2 lp (34-95,98), 1 ♂, 1 ♀; 14 July 1965, J.A. Ochoa (COB 36), 2 lp♂ (36-21,22), 1 lp♀ (36-20), (COB 37, type series), 3 lp♂ (37-11, 12,16), 3 lp♀ (37-10,17,18) [USNM, BM, UCLA].

VENEZUELA. *Aragua*: (Cova Garcia, Sutil and Rausseo 1966b:141). *Merida*: Sierra Nevada, elev. 9000 ft, Dec 1923, E.P. de Bellard, 1 ♀ [USNM].

31. Aedes (Howardina) ecuadoriensis Berlin, n.sp.

Figs.6,9,58

TYPES: Holotype ♀ (ECU 4), Leon River, Saraguro, Azuay, Ecuador, 5500 ft, adult collection, 22 Mar 1965, L.E. Pena G. [USNM]. Paratypes: 4 ♀ (ECU 4), same data as holotype [UCLA].

FEMALE. Wing: 2.88 mm. Proboscis: 2.25 mm. Forefemur: 1.62 mm. Abdomen: about 2.25 mm. Similar to *eleanorae*, with the following diagnostic differences. *Head*: Light scales on median and short orbital lines moderately broad, white; sides and venter with white scales. Erect scales dark. Palpus about 0.15 of proboscis; predominantly dark, with white scales on apex and base of segment 4. Mesal patch on torus white. *Thorax* (fig.9): Mesonotal light lines white and golden; inner dorsocentral line complete, narrow, white; outer dorsocentral line apparently complete, narrow, pale golden, extending from anterior margin to scutellum, a few anterior scales whitish; lateral marginal line short, whitish, extending from scutal angle to wingbase; scales on anterior promontory white. Light scales on median scutellar lobe broad, white, narrow and brown on lateral lobes. Scales on paratergite broad and white. *Apn* scales moderately broad, white; *ppn* with large upper and small lower scale patch; former with narrow white scales above, broad below; latter with broad white scales; other scale patches broad, white scaled, distributed as in the group. *Legs*: Forefemur dark scaled anteriorly, posterior surface predominantly creamy except for narrow longitudinal dark line from base to apex; midfemur and hindfemur mostly dark anteriorly except for a ventral white line to middle and a white spot at 0.67, posteriorly proximal 0.5 creamy, rest dark. Foretarsus with short incomplete white rings on segments 1,2; midtarsus with short white rings on 1-3; hindtarsus with broader white rings on 1-4. *Haltere*: Stem pale, knob predominantly white, a few brown scales dorsally. *Abdomen*: Basomedian tergal light scales dingy white on II-VII. Sternites with broad basal V-shaped patches of white scales; apical light scales distinct up to segment V.

MALE. Wing: 3.06 mm. Proboscis: 2.71 mm. Forefemur: 1.75 mm. Essentially similar to female in color. Palpus predominantly dark, basoventral parts of segments 4 and 5 white scaled.

MALE GENITALIA (fig.58). Diagnostic characters as in the key. Ninth tergite lobe prominent, with 6,7 moderate to strong bristles, inner markedly flattened and almost leaflike. Sidepiece length about 3.5 of median width. Clasper about 0.5 of sidepiece, with 2,3 subapical hairs; minute spicules in basal 0.5; spiniform short, 0.25

of clasper. Aedeagus short; dorsal sclerotization deeply emarginate, producing distinct lateral sclerotized lobes.

PUPA, LARVA unknown.

SYSTEMATICS. *A. ecuadoriensis* is readily separated from the apparently closely related *brevivittatus* by constant differences in mesonotal, pleural and tarsal markings. It is known only from 2 widely spearated localities in northern and southern Ecuador in semi-arid areas (chaparral and high desert) at elevations between 5,000 and 6,000 feet, whereas *brevivittatus* is known at present only from intermediate localities with a range of elevations from 4,200 to nearly 11,000 feet, apparently always in humid forests.

BIONOMICS. Most of the known material of *ecuadoriensis* consists of females taken in biting-landing collections between the hours of 0600 and 1500. The immature stages will probably be found in bromeliads which undoubtedly contain water during the period of seasonal rainfall characteristic of the areas where the adults were collected.

DISTRIBUTION (fig.6). Ecuador (chaparral and high desert areas) at elevations of 5000-6000 ft. Material examined: 10 specimens; 2 ♂, 8 ♀; no individual rearings or immature stages.

ECUADOR. *Azuay*: Saraguro, Leon River, elev. 5500 ft, 22 Mar 1965, L.E. Pena G., 5 ♀ (ECU 4), type series [USNM, UCLA]. *Imbabura*: Ibarra, Taguando River, elev. 5400-5800 ft, 9 June 1965, L.E. Pena G., 2 ♂, 3 ♀ (ECU 25) [UCLA].

32. Aedes (Howardina) brevivittatus Berlin, n.sp.

Figs.6,9,58

TYPES: Holotype ♀, Zorrocucho, Azuay, Ecuador, 3500 m, date not specified, Levi-Castillo [USNM]. Allotype ♂ with associated genitalia slide, same data as holotype [USNM]. Paratypes: 8 ♀, same data as holotype [USNM, UCLA].

Aedes (Howardina) quadrivittatus in part of Dyar (1928:229); Edwards (1932:155); Lane (1939: 100; 1953:713); Levi-Castillo (1953:40); Stone, Knight and Starcke (1959:174).

FEMALE. Wing: 5.04 mm. Proboscis: 3.27 mm. Forefemur: 2.79 mm. Abdomen: about 4.55 mm. Similar to *eleanorae*, differing in larger size and in the following. *Head*: Light scales of median and short orbital lines creamy; light scales on sides and venter whitish. Erect scales predominantly brown, a few middle ones paler. Palpus about 0.14 of proboscis; predominantly dark, with white scales on apex and mesal side of segment 4. Mesal patch on torus white. *Thorax* (fig.9): All mesonotal light lines creamy to pale golden; inner dorsocentral line slightly broadened on anterior 0.5, gradually narrowing caudad; outer dorsocentral line shorter, from anterior 0.25 to scutellum; lateral marginal line longer, from anterior promontory to wingbase; scales on anterior promontory golden. Light scales on median scutellar lobe narrow, white; lateral lobes with narrow, brown scales. Scales on paratergite broad, dingy white. *Apn* scales broad, dingy white, a few anterior ones narrower; *ppn* with only an upper patch of predominantly narrow, creamy scales, a few broader ones below; other pleural patches with broad white scales, distributed as in the group. *Legs*: Forefemur dark brown anteriorly, posteriorly proximal 0.5 predominantly creamy extending distally as a narrow creamy line, rest dark; midfemur mostly dark brown anteriorly except for a few basal creamy scales and a white spot at 0.67, posteriorly proximal 0.5 creamy, extending distally as a creamy line, rest dark; hindfemur creamy to 0.75 anteriorly, 0.67 posteriorly, rest dark scaled. Foretarsus with a few white scales on segments 1,2; midtarsus with short incomplete white rings on 1-3; hindtarsus with short white rings on 1-4. *Haltere*: Stem pale, knob predominantly dark, fringe scales whitish. *Abdomen*: Basal tergal light bands creamy to V, white on VI,VII. Sternites with broad basal patches, creamy basally and white on sides; apical creamy to white scales distinct up to segment V.

MALE. Wing: 5.6 mm. Proboscis: 3.45 mm. Forefemur: 2.37 mm. Essentially similar to female in color. Palpus predominantly dark, basoventral parts of segments 4 and 5 white scaled.

MALE GENITALIA (fig.58). As figured; diagnostic characters as in the key. Ninth tergite lobe prominent, with 6,7 strong bristles. Sidepiece length about 2.5 of median width. Clasper about 0.5 of sidepiece, with 1,2 subapical hairs; spiniform moderate, about 0.33 of clasper. Aedeagus subquadrate; dorsal sclerotization deeply emarginate, producing distinct lateral lobes.

PUPA, LARVA unknown.

SYSTEMATICS. *A. brevivittatus* is apparently closely related to *ecuadoriensis* with which it is broadly sympatric in Ecuador but from which it seems to be isolated by a strong ecological barrier. While *ecuadoriensis* is known only from semi-arid localities at elevations of 5,000 to 6,000 feet, *brevivittatus* has been collected only in humid forests at elevations from 4,200 to nearly 11,000 feet, apparently only on the western slopes of the Andes.

BIONOMICS. The immature stages of *brevivittatus* will undoubtedly be found in epiphytic and/or terrestrial bromeliads. The present collections consist mostly of females taken biting-landing on humans between the hours of 1000 and 1800.

DISTRIBUTION (fig.6). Humid forests on western slopes of Andes in Ecuador at elevations of 4200-11,000 ft. Material examined: 25 specimens; 8 ♂, 17 ♀; no individual rearings or immature stages.

ECUADOR. *Azuay*: Cuenca, Caserio Tinajillas, elev. 10,000 ft, 18-21 Mar 1965, L.E. Pena G., 7 ♂, 7 ♀ (ECU 3) [UCLA]. Zorrocucho, elev. 3500 m, Levi-Castillo, 1 ♂, 9 ♀, type series [USNM, UCLA]. *Canar*: (Levi-Castillo 1953:40). *Pichincha*: Santo Domingo, Tandapi, elev. 4400-5400 ft, 20-21 June 1965, L.E. Pena G., 1 ♀ (ECU 27) [UCLA].

Aurivittatus Group

FEMALES. *Head*: Median light line on vertex with narrow scales. Proboscis distinctly longer than forefemur. Torus with restricted mesal scale patch. *Thorax*: Mesonotal light lines usually creamy to golden; inner dorsocentral line complete; outer dorsocentral line either complete or not reaching anterior margin, subparallel to inner; lateral marginal line continuous; scales on anterior promontory pale golden. Antealar area above paratergite with golden scales. Paratergite with a moderate scale patch extending entire sclerite length. Upper *ppn* entirely covered with light scales; upper *stp* patch quadrate. *Legs*: Distal white spot on anterior surface of midfemur distinct, absent on hindfemur. Tibiae completely dark. *Wing*: Remigium with white scales. *Abdomen*: Basomedian tergal light markings absent.

MALES. Palpus with basomedian light scales on segments 4 and 5.

MALE GENITALIA. Lobe of tergite IX distinct, with 5,6 strong bristles. Sidepieces separated at base by a distance less than width of aedeagus; without any indication of lobes on tergomesal or sternomesal margins. Claspette represented by a conical tubercle. Aedeagus shorter than proctiger; apex slightly emarginate, producing lateral lobes.

PUPAE and LARVAE unknown.

DISCUSSION. The Aurivittatus Group is recognized here for the nominate form, *vanemdeni* and *martinezi* on the basis of the presence of pale scales on the remigium. The immature stages are unknown for the group and I have not seen any males. The group is doubtfully distinct from the Eleanorae Group and may have to be merged with it if the immature stages prove to be similar. Members of this group have been occasionally misidentified as *sexlineatus* in the past.

The group occupies the southernmost portion of the distribution of the section. *A. aurivittatus* and *vanemdeni* have been found only in Bolivia, at moderate elevations in the Amazon basin; *martinezi* is known at moderate elevations in the Amazon basin in Bolivia and from northern Argentina at an elevation of about 5,000 feet and is one of the 2 members of the section reported from the La Plata drainage (fig.5).

33. Aedes (Howardina) aurivittatus Cerqueira

Figs.5,9

1943.*Aedes (Howardina) aurivittatus* Cerqueira, 1943a:7-8. TYPE: Holotype ♀, Pampagrande, Florida, Santa Cruz, Bolivia, Feb 1940 [IOC].

Aedes (Howardina) aurivittatus of Cerqueira (1943b:33); Del Ponte, Castro and Garcia (1951:240); Lane (1953:711); Stone, Knight and Starcke (1959:173); in part of Martinez, Prosen and Carcavallo (1964:53-58); Prosen, Carcavallo and Martinez (1964:103); Forattini (1965:461); Stone (1967:208).

FEMALE. Wing: 3.24 mm. Proboscis: 2.16 mm. Forefemur: 1.89 mm. Abdomen: about 2.88 mm. *Head*: Light decumbent scales on head white. Erect scales extending to vertex, light brown on occiput. Palpus about 0.16 of proboscis; white scales restricted to base and apex of segment 4. Mesal scale patch on torus silvery white. *Thorax* (fig.9): Mesonotal light lines creamy to pale golden; inner dorsocentral line complete, extending from anterior margin to scutellum; outer dorsocentral line complete, merging with lateral marginal line at level of humeral bristles; lateral marginal line long, extending from humeral bristles to wingbase. Median scutellar lobe with broad dark scales laterally and moderately broad creamy scales from base to apex in middle; lateral lobe with a few narrow creamy scales. Paratergite with moderately broad white scales. Scales on *apn* predominantly broad and white, a few anterior ones narrower; *ppn* with large upper and small lower patches, former predominantly with narrow scales except for lower broader ones, latter with broad white scales; *psp* with a few broad white scales restricted to posterior part of bristles; other patches pure white, distributed as in the group. *Legs*: Forefemur mostly dark except for a few white scales at base anteriorly and a creamy longitudinal line posteriorly; midfemur predominantly dark anteriorly except for a narrow mesal line from base terminating in a distinct silvery spot at 0.67, posteriorly proximal 0.5 creamy, rest dark; hindfemur mostly creamy to 0.67 on both sides, rest dark scaled. Foretarsus and midtarsus with a few white scales on segment 1; hindtarsus with moderately broad white rings on segments 1-3. *Haltere*: Stem pale, knob brown scaled basally, fringe scales whitish. *Abdomen*: Sternites with broad V-shaped basal white patches; median apical white scales few, present up to segment V.

MALE. Not seen; according to the description of Martinez, Prosen and Carcavallo (1964:53-58), essentially similar to female as described above.

MALE GENITALIA. Diagnostic characters as in the key. Ninth tergite lobe prominent, with 6 strong bristles. Sidepiece length about 3.0 median width. Clasper about 0.5 of sidepiece, with 1 subapical hair; spiniform long, about 0.5 of clasper. Aedeagus shorter than proctiger; dorsal sclerotization slightly emarginate, producing lateral lobes.

PUPA, LARVA unknown.

SYSTEMATICS. The 3 females of *aurivittatus* I have examined are readily separated from *martinezi* by the diagnostic characters mentioned above. This species appears to be restricted to moderate elevations in the upper parts of the Amazon drainage in Bolivia. The record of *aurivittatus* from La Caldera (Salta), Argentina, is probably erroneous and based on the closely related *martinezi* which has been collected in the same locality.

BIONOMICS. The immature stages are unknown but should be found in the axils of epiphytic and/or terrestrial bromeliads, the only known breeding sites of the members of the Sexlineatus Section. Females of *aurivittatus* are evidently at least occasionally attracted to humans, presumably in the daytime.

DISTRIBUTION (fig.5). Bolivia (upper Amazon drainage) at moderate elevations. Material examined: 3 specimens; 3 ♀; no individual rearings or immature stages.

BOLIVIA. *Cochabamba*: Chapare, 27 Apr 1944, 1 ♀ [USNM]. *Santa Cruz*: Florida, Feb 1940, N.L. Cerqueira, 2 ♀ paratypes [USNM].

34. Aedes (Howardina) martinezi Berlin, n.sp.

Figs.5,9

TYPE: Holotype ♀ (ARG-1), La Caldera, Salta, Argentina, 27 Mar 1966, A. Martinez [USNM]. Paratypes: 30 ♀, same data as holotype [USNM, BM, UCLA]. This species is dedicated to Dr. A. Martinez for his contributions to the study of neotropical mosquitoes.

Aedes (Howardina) aurivittatus in part of Martinez and Prosen (1955:25-27); Castro, Garcia and Bressanello (1959:550).

FEMALE. Wing: 3.42 mm. Proboscis: 2.36 mm. Forefemur: 2.19 mm. Abdomen: 2.91 mm. Essentially similar to *aurivittatus*, differing apparently only in the following. *Head*: Light decumbent scales dull creamy. Erect scales on occiput largely brownish, a few darker. *Thorax* (fig.9): Mesonotal light lines pale golden; outer dorsocentral line shorter, arising at anterior 0.25; lateral marginal line long, from side of anterior promontory to wingbase. Lateral scutellar lobes with a few narrow dark scales.

MALE, PUPA, LARVA unknown.

SYSTEMATICS. *A. martinezi* has been confused in the past with *aurivittatus* from which it is clearly differentiated by the diagnostic characters mentioned above which are remarkably constant in the small type series. Apparently *martinezi* extends from moderate elevations in the Amazon basin in Bolivia to the upper part of the La Plata drainage in northern Argentina.

BIONOMICS. The immature stages are unknown but will probably be found in the axils of bromeliads. The adults have been captured biting and landing on humans during the day at elevations of about 5,000 feet.

DISTRIBUTION (fig.5). Bolivia (upper Amazon drainage) and Argentina (upper La Plata drainage), at moderate to high elevations. Material examined: 32 specimens; 32 ♀, no individual rearings or immature stages.

ARGENTINA. *Salta*: La Caldera, 3.0 mi before mountain pass Sta. Laura, elev. 5000 ft, 27 Mar 1966, A. Martinez, 31 ♀ (ARG-1, type series) [USNM, BM, UCLA].

BOLIVIA. *Cochabamba*: Chimore, 30 Apr 1944, 1 ♀ [USNM].

35. Aedes (Howardina) vanemdeni Martini

Figs.5,9

1931.*Aedes vanemdeni* Martini, 1931:208-209. TYPE: Lectotype ♂, Yungas de Coroico (La Paz), Bolivia, elev. 1000 m [BM; selection of Mattingly 1955:31].

Aedes (Howardina) vanemdeni of Lane (1939:101); Martinez (1950:39); Del Ponte, Castro and Garcia (1951:240); Lane (1953:716); Martinez and Prosen (1953:28,30; 1955:32); Castro, Garcia and Bressanello (1959:550); Stone, Knight and Starcke (1959:174); Prosen, Carcavallo and Martinez (1964:105).

FEMALE. Not seen.

MALE. Essentially similar to *aurivittatus*, differing apparently only in the following (fig.9). Lateral marginal line short, not connected to outer dorsocentral line at level of humeral bristles and extending from scutal angle to wingbase. Forefemur and midfemur with a distinct white spot anteriorly at distal 0.67. Foretarsus and midtarsus with white scales on segments 1-3; hindtarsus with white ring only on segment 1; rest dark scaled. *Haltere*: Stem pale, knob entirely white scaled.

MALE GENITALIA. Ninth tergite lobe distinct, with 5 strong bristles. Sidepiece length about 3.0 of median width. Clasper and spiniform as in *aurivittatus*.

PUPA and LARVA unknown.

SYSTEMATICS. *A. vanemdeni* is readily differentiated from other members of the Aurivittatus Group by the distribution of the tarsal white markings. The male genitalia appear to be similar to *aurivittatus*. *A. vanemdeni* is known only by the ♂ (lectotype) and ♀ of the original type series from moderate elevations in the Amazon basin in Bolivia.

BIONOMICS. The unknown immature stages will probably be found in bromeliad axils. Females are presumably at least occasionally attracted to man.

DISTRIBUTION. Bolivia (fig.5). Material examined: ♂ lectotype examined by J.N. Belkin [BM].

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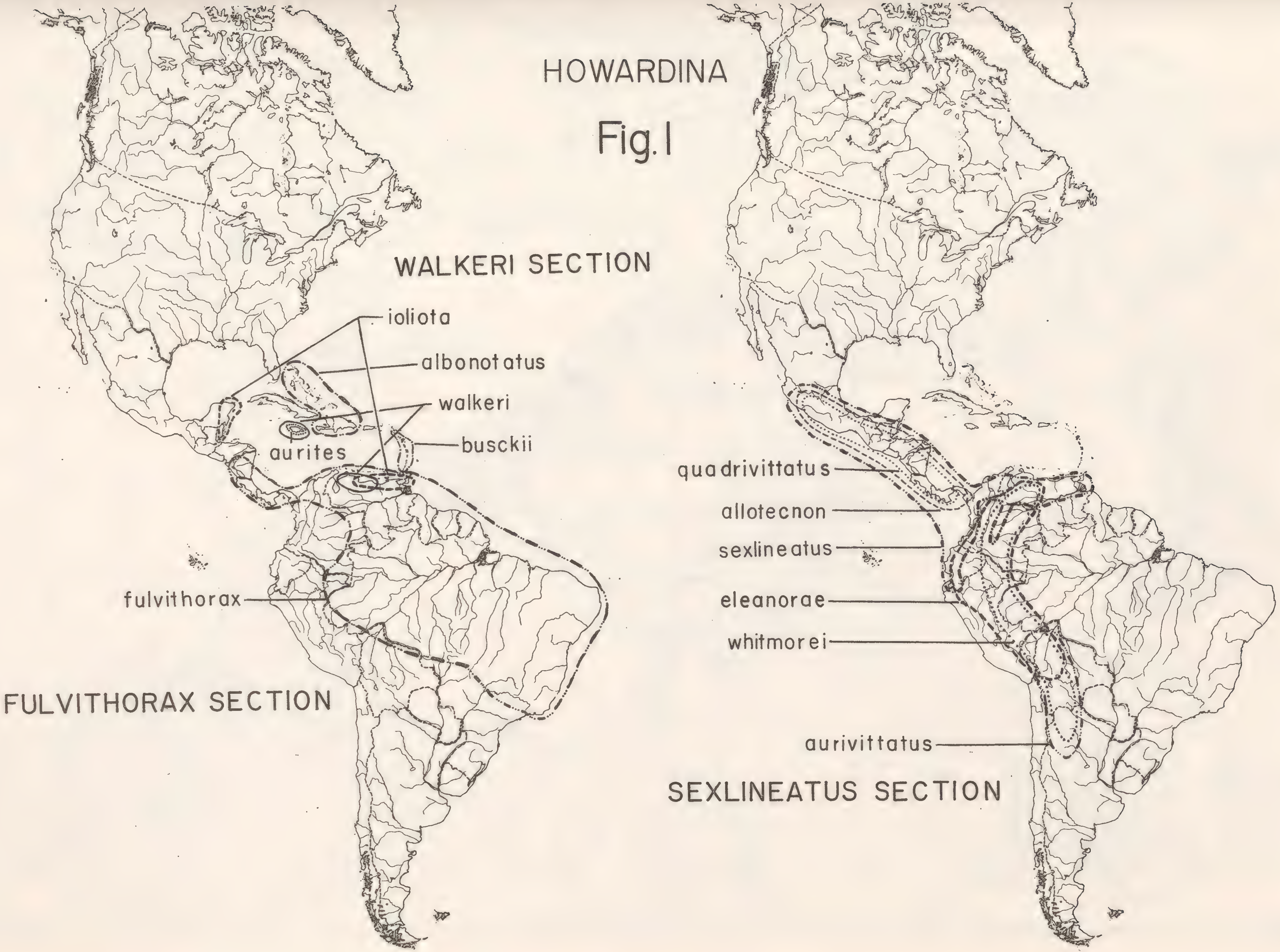
FIGURES

1. Distribution of the groups of *Howardina*
2. Distribution of the species of the Fulvithorax Section
3. Distribution of the species of the Walkeri Section
4. Distribution of *Aedes (H.) sexlineatus*
5. Distribution of the species of the Quadrivittatus, Whitmorei and Aurivittatus Groups
6. Distribution of the species of the Allotecnon and Eleanorae Groups
7. Biting-landing cycle of *Howardina* species near Porus, Jamaica
8. Mesonotal scale pattern of *Howardina* species
9. Mesonotal scale pattern of *Howardina* species
10. *Aedes (H.) fulvithorax*; pleuron, male genitalia and pupa
11. *Aedes (H.) fulvithorax*; larva
12. *Aedes (H.) septemstriatus*; male genitalia and pupa
13. *Aedes (H.) septemstriatus*; larva
14. *Aedes (H.) arborealis*; male genitalia and pupa
15. *Aedes (H.) arborealis*; larva
16. *Aedes (H.) walkeri*; adult morphology
17. *Aedes (H.) walkeri*; pleuron, male genitalia and pupa
18. *Aedes (H.) walkeri*; larva
19. *Aedes (H.) aurites*; male genitalia and pupa
20. *Aedes (H.) aurites*; larva
21. *Aedes (H.) grabhami*; male genitalia and pupa
22. *Aedes (H.) grabhami*; larva
23. *Aedes (H.) inaequalis*; male genitalia and pupa
24. *Aedes (H.) inaequalis*; larva
25. *Aedes (H.) stenei*; male genitalia and pupa
26. *Aedes (H.) stenei*; larva
27. *Aedes (H.) ioliota*; male genitalia and pupa
28. *Aedes (H.) ioliota*; larva
29. *Aedes (H.) cozumelensis*; male genitalia and pupa
30. *Aedes (H.) cozumelensis*; larva
31. *Aedes (H.) albonotatus*; male genitalia and pupa
32. *Aedes (H.) bahamensis*; male genitalia and pupa
33. *Aedes (H.) bahamensis*; larva
34. *Aedes (H.) busckii*; male genitalia and pupa
35. *Aedes (H.) busckii*; larva
36. *Aedes (H.) quadrivittatus*; pleuron, male genitalia and pupa
37. *Aedes (H.) quadrivittatus*; larva
38. *Aedes (H.) lorraineae*; larva
39. *Aedes (H.) brevis*; male genitalia and pupa
40. *Aedes (H.) brevis*; larva
41. *Aedes (H.) spinosus*; male genitalia and pupa
42. *Aedes (H.) spinosus*; larva
43. *Aedes (H.) sexlineatus*; male genitalia and pupa
44. *Aedes (H.) sexlineatus*; larva
45. *Aedes (H.) whitmorei*; male genitalia and pupa
46. *Aedes (H.) whitmorei*; larva
47. *Aedes (H.) allotecnon*; male genitalia and pupa

48. *Aedes (H.) allotecnon*; larva
49. *Aedes (H.) guerrero*; larva
50. *Aedes (H.) eleanorae*; male genitalia and pupa
51. *Aedes (H.) eleanorae*; larva
52. *Aedes (H.) marinkellei*; pupa
53. *Aedes (H.) marinkellei*; larva
54. *Aedes (H.) leei*; male genitalia and pupa
55. *Aedes (H.) leei*; larva
56. *Aedes (H.) osornoi*; male genitalia and pupa
57. *Aedes (H.) osornoi*; larva
58. *Aedes (H.) aureolineatus, pseudodominicii, ecuadoriensis* and *brevivittatus*; male genitalia



HOWARDINA

Fig. 1

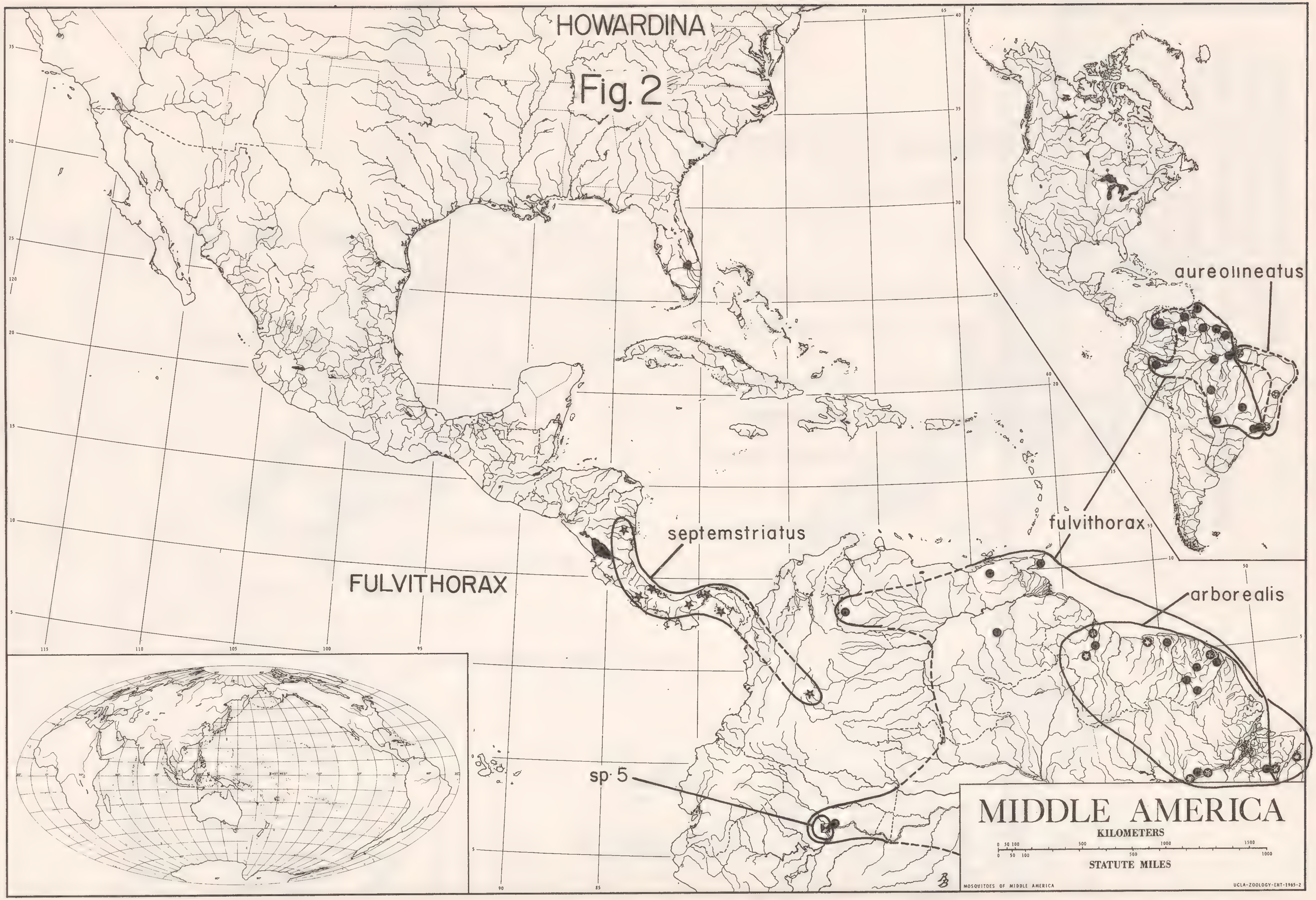

HOWARDINA
FULVITHORAX
septemstriatus
fulvithorax
arborealis
aureolineatus
sp 5
MIDDLE AMERICA
KILOMETERS
STATUTE MILES
MOSQUITOES OF MIDDLE AMERICA
UCLA-ZOOLOGY-ENT-1965-2

Fig. 2

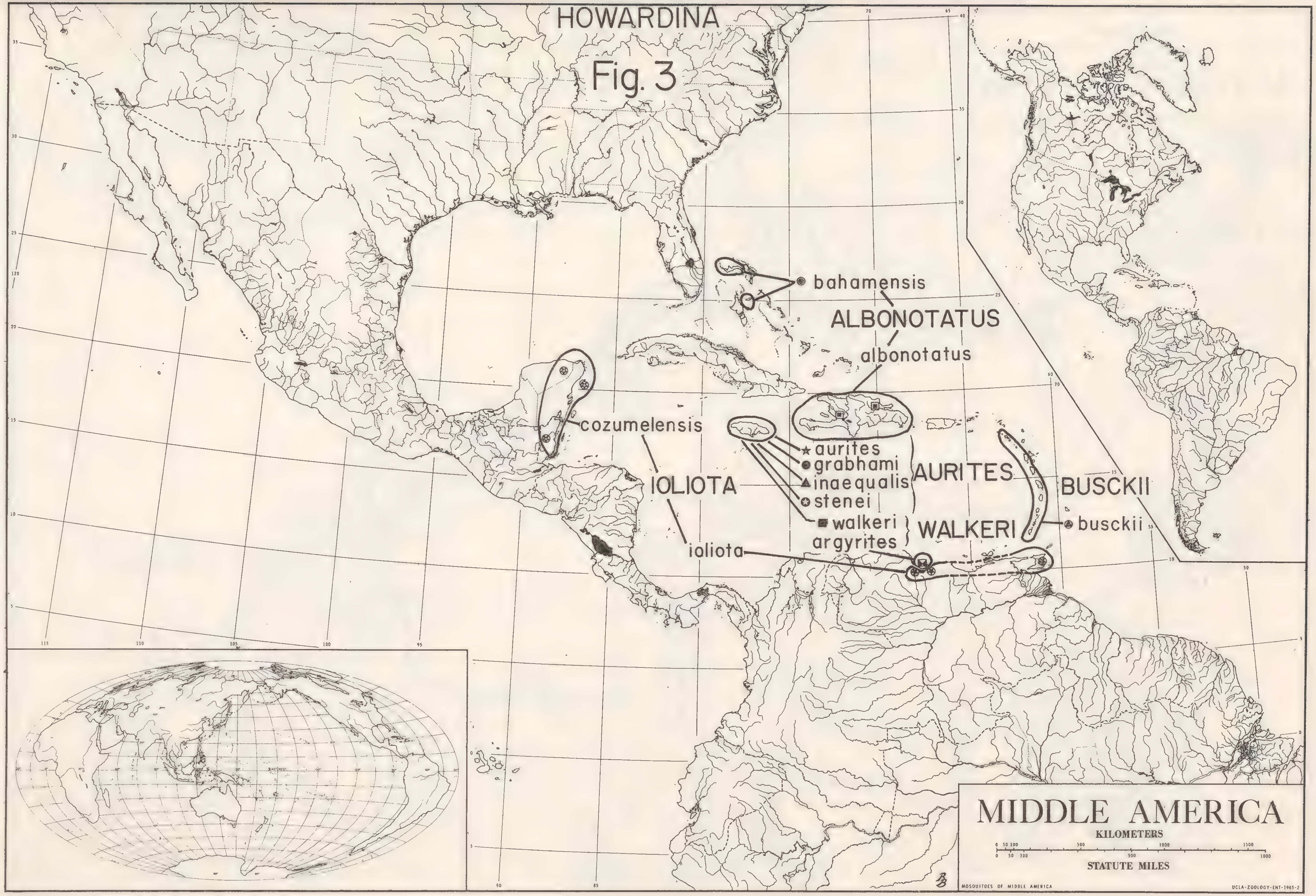


Fig. 3

HOWARDINA
bahamensis
ALBONOTATUS
albonotatus
cozumelensis
★ aurites
● grabhami
▲ inaequalis
✪ stenei
■ walkeri
AURITES
IOLIOTA
BUSCKII
busckii
WALKERI
argyrites
ioliota
MIDDLE AMERICA
KILOMETERS
0 50 100 500 1000 1500
0 50 100 500 1000
STATUTE MILES
MOSQUITOES OF MIDDLE AMERICA
UCLA-ZOOLOGY-ENT-1965-2

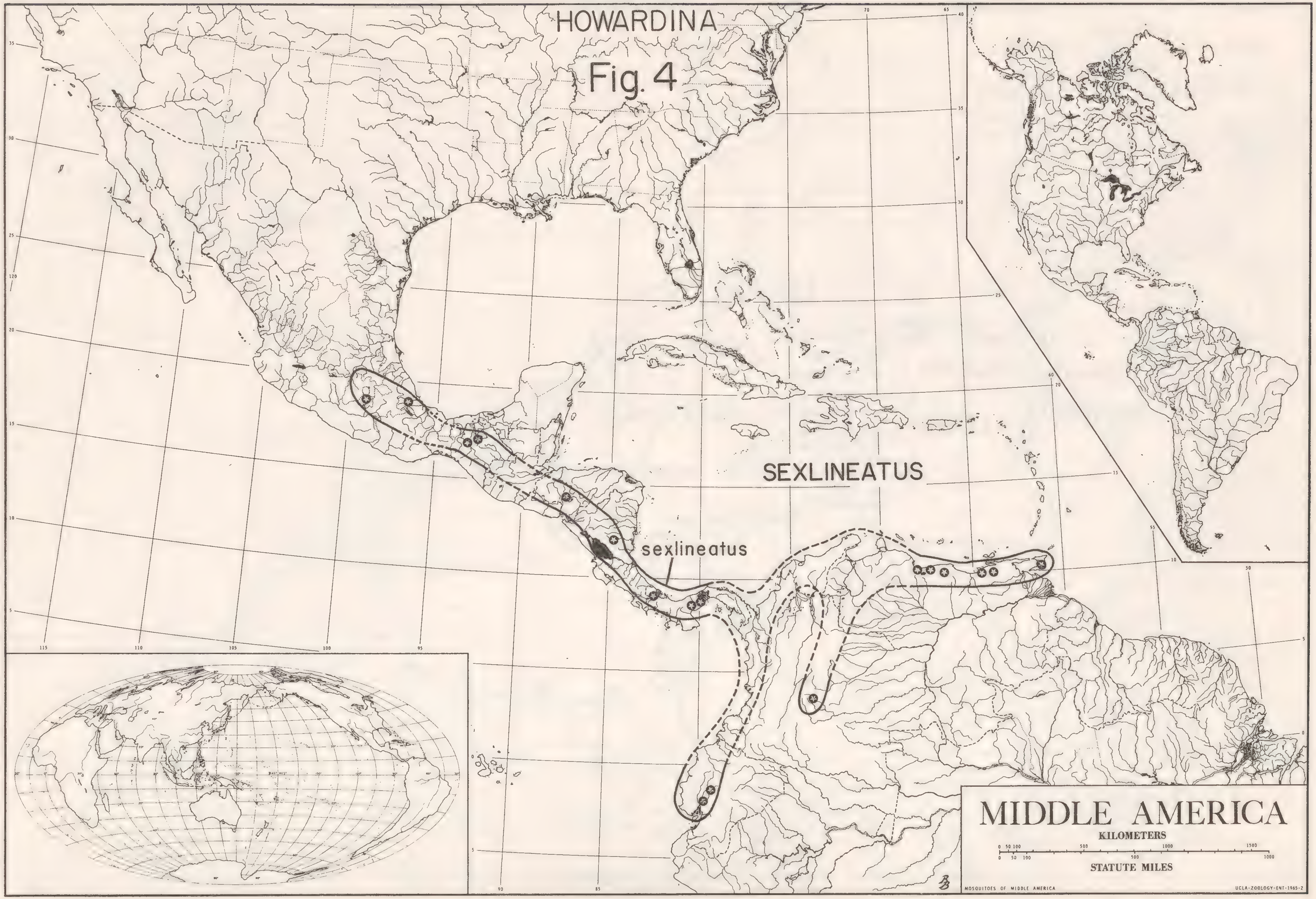
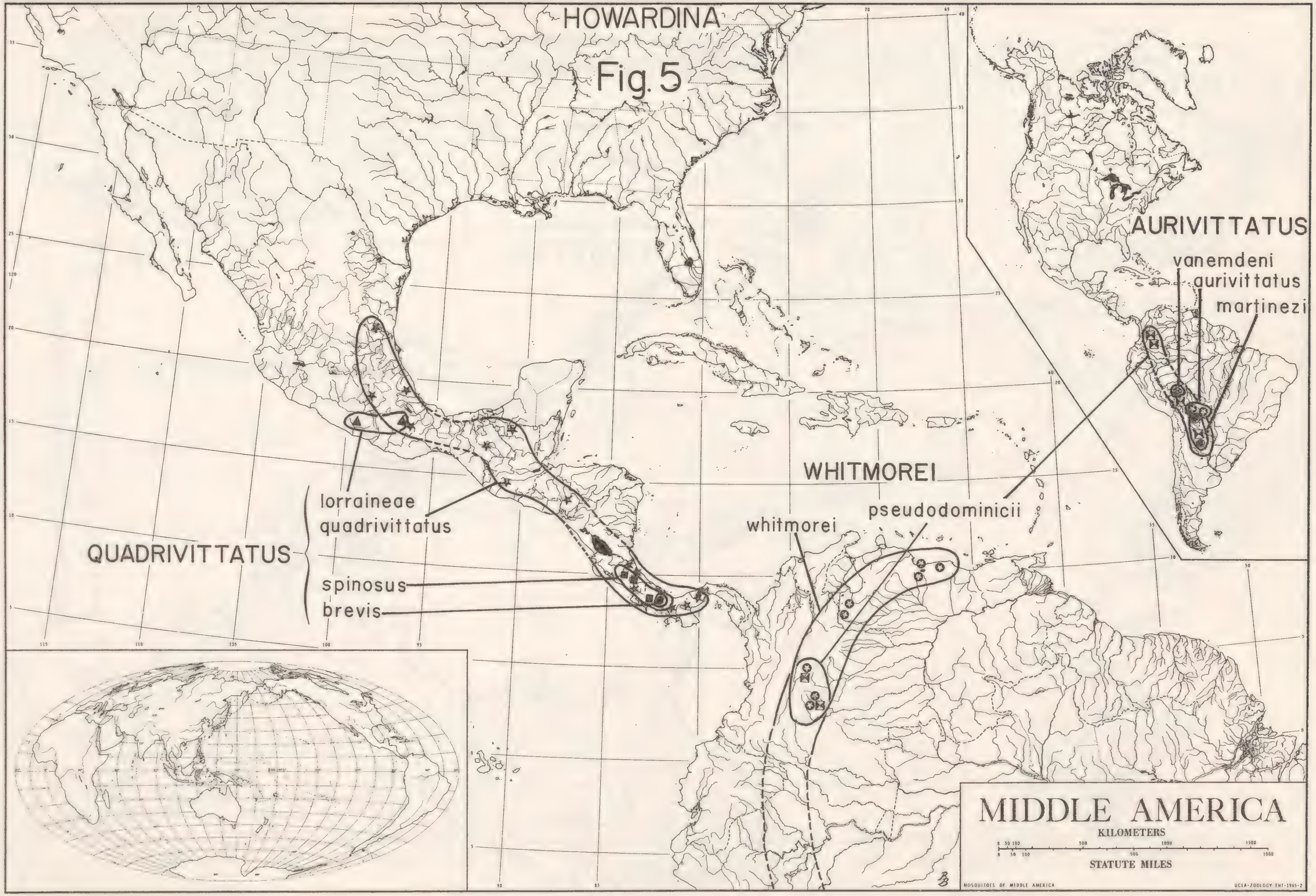


Fig. 4

HOWARDINA
SEXLINEATUS
sexlineatus
MIDDLE AMERICA
KILOMETERS
STATUTE MILES
MOSQUITOES OF MIDDLE AMERICA
UCLA-ZOOLOGY-ENT-1965-2


HOWARDINA
Fig. 5
AURIVITTATUS
vanemdeni
aurivittatus
martinezi
WHITMOREI
whitmorei
pseudodominicii
QUADRIVITTATUS
lorraineae
quadrivittatus
spinosus
brevis
MIDDLE AMERICA
KILOMETERS
0 50 100 500 1000 1500
0 50 100 500 1000
STATUTE MILES
MOSQUITOES OF MIDDLE AMERICA
UCLA-ZOOLOGY ENT-1965-2

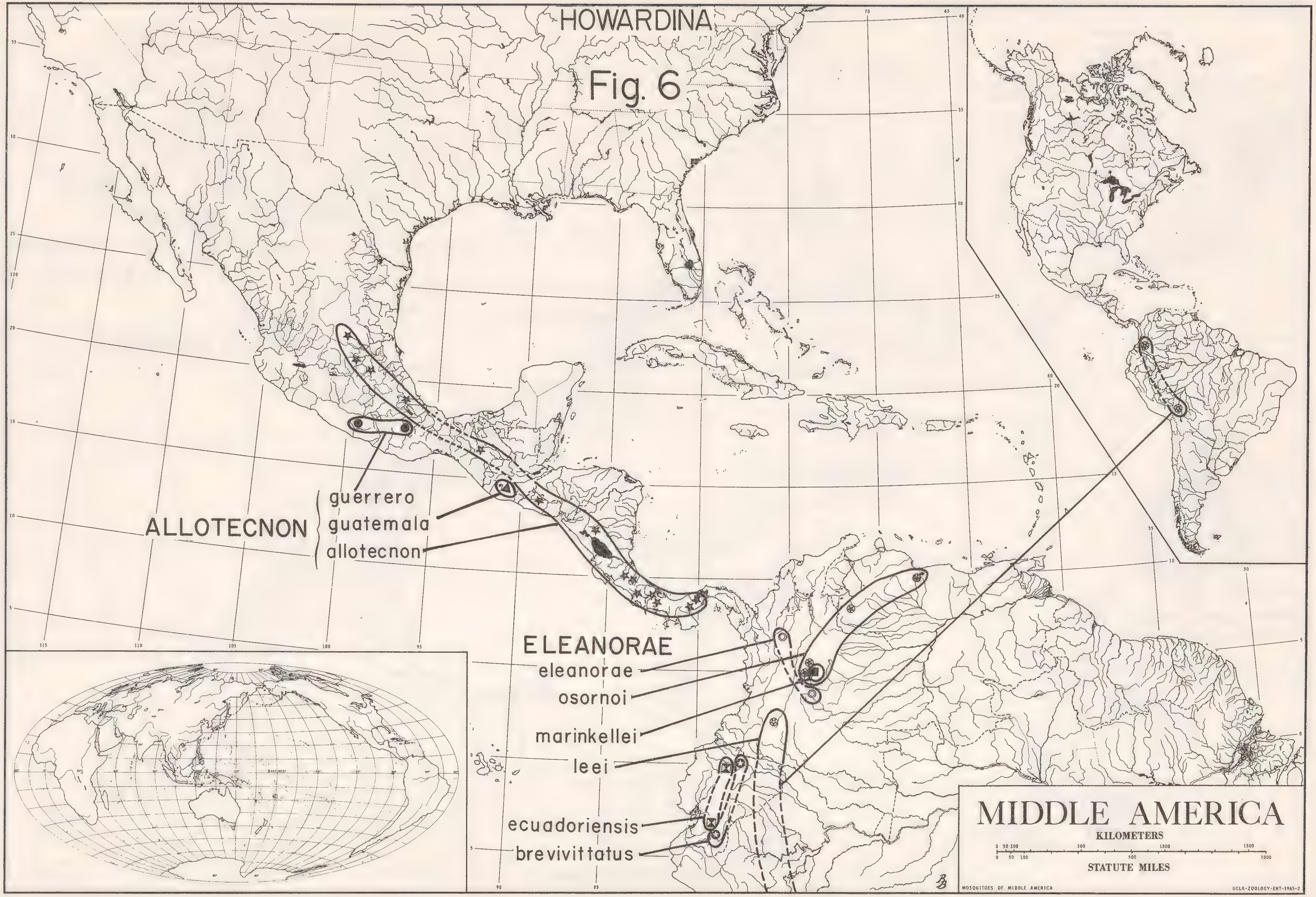
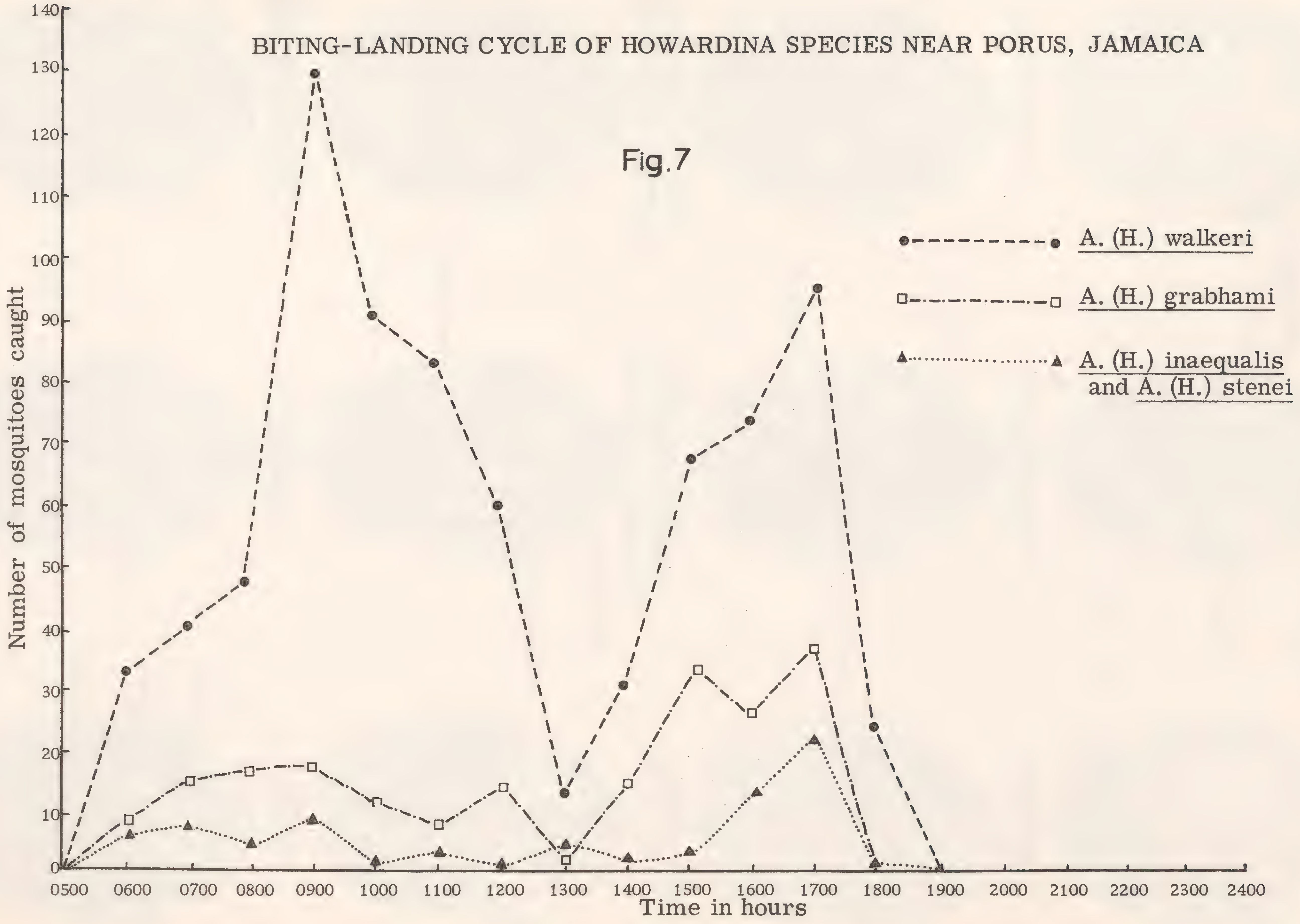


Fig. 6
HOWARDINA
ALLOTECNON
guerrero
guatemala
allotecnon
ELEANORAE
eleanorae
osornoi
marinkellei
leei
ecuadoriensis
brevivittatus
MIDDLE AMERICA
KILOMETERS
STATUTE MILES
MOSQUITOES OF MIDDLE AMERICA
UCLA-ZOOLOGY-ENT-1965-2

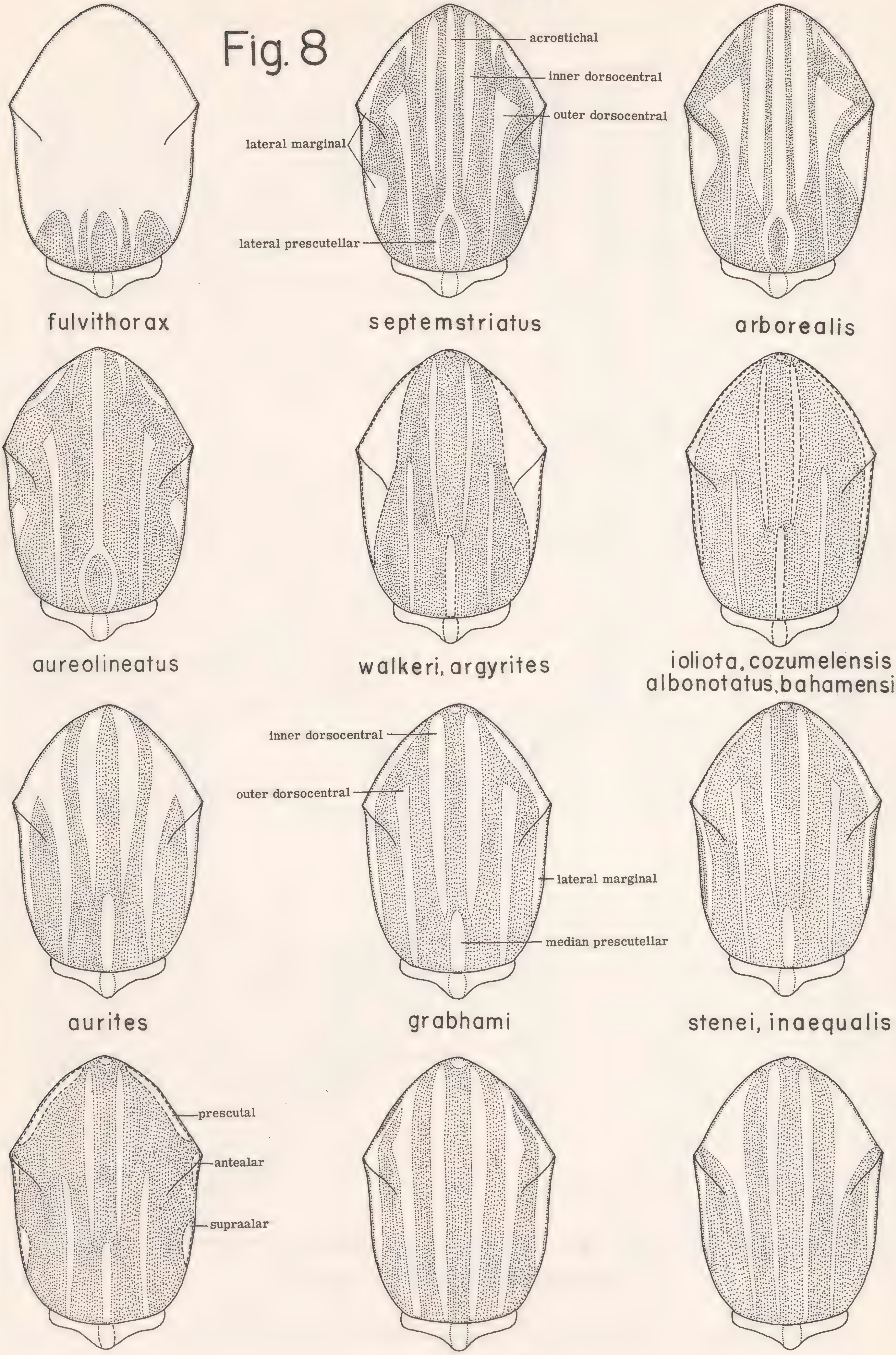


BITING-LANDING CYCLE OF HOWARDINA SPECIES NEAR PORUS, JAMAICA

Fig.7

HOWARDINA

Fig. 8



fulvithorax

septemstriatus

arborealis

aureolineatus

walkeri, argyrites

ioliota, cozumelensis
albonotatus, bahamensis,

aurites

grabhami

stenei, inaequalis

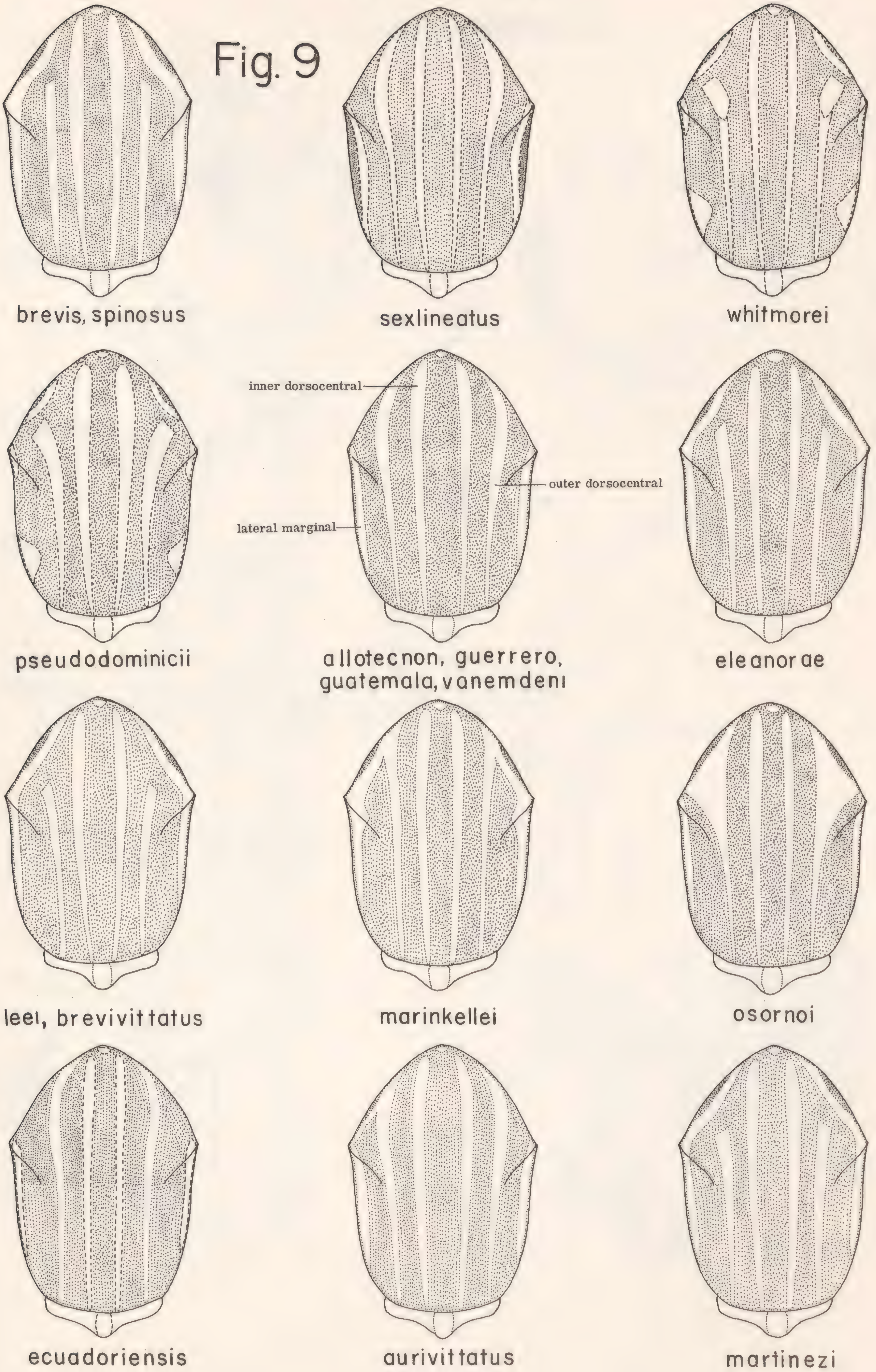
busckii

quadrivittatus

lorraineae

HOWARDINA

Fig. 9



brevis, spinosus

sexlineatus

whitmorei

pseudodominicii

allotecnon, guerrero, guatemala, vanemdeni

eleanorae

leei, brevivittatus

marinkellei

osornoi

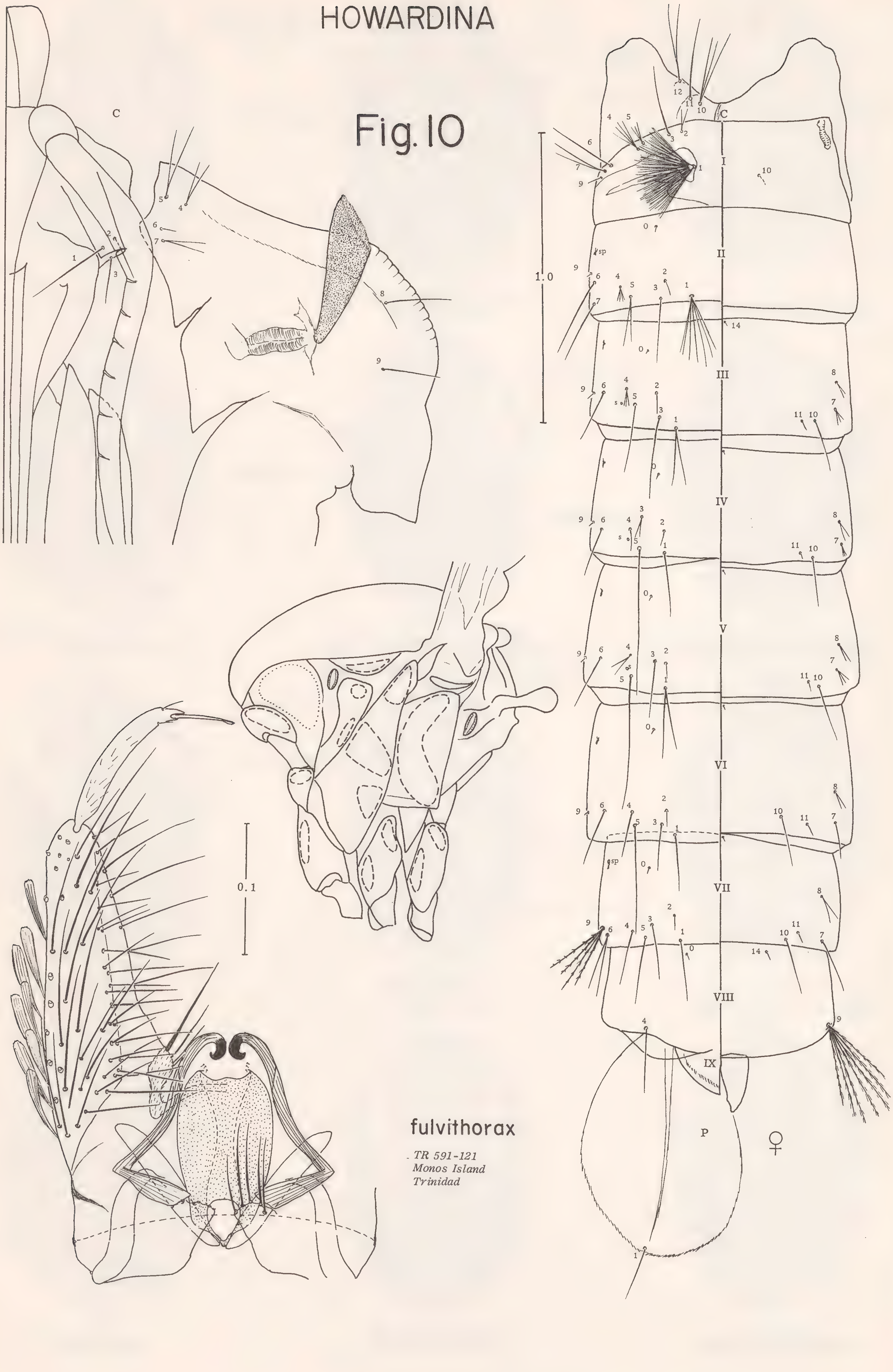
ecuadoriensis

aurivittatus

martinezi

HOWARDINA

Fig. 10



fulvithorax

TR 591-121
Monos Island
Trinidad

HOWARDINA

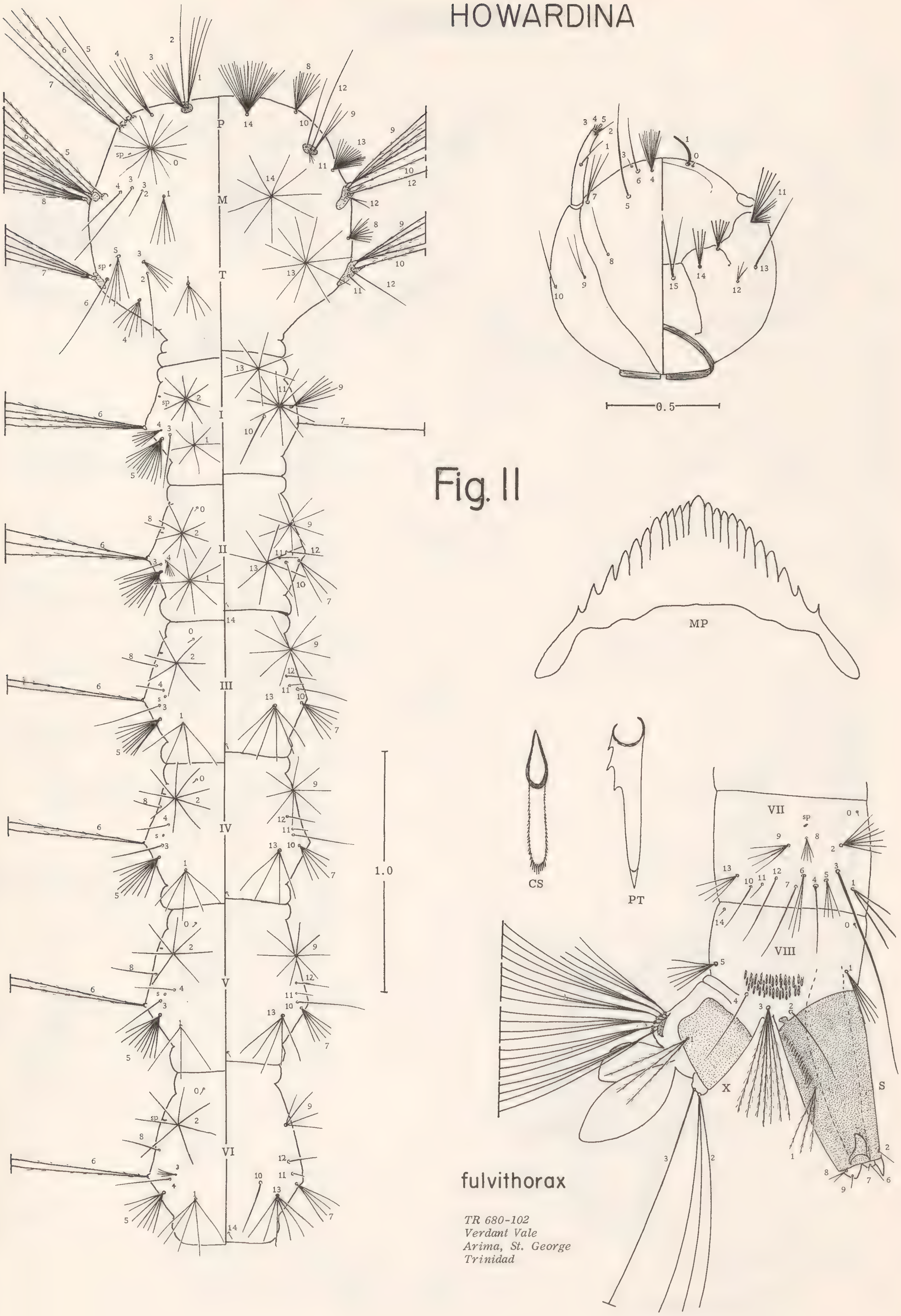


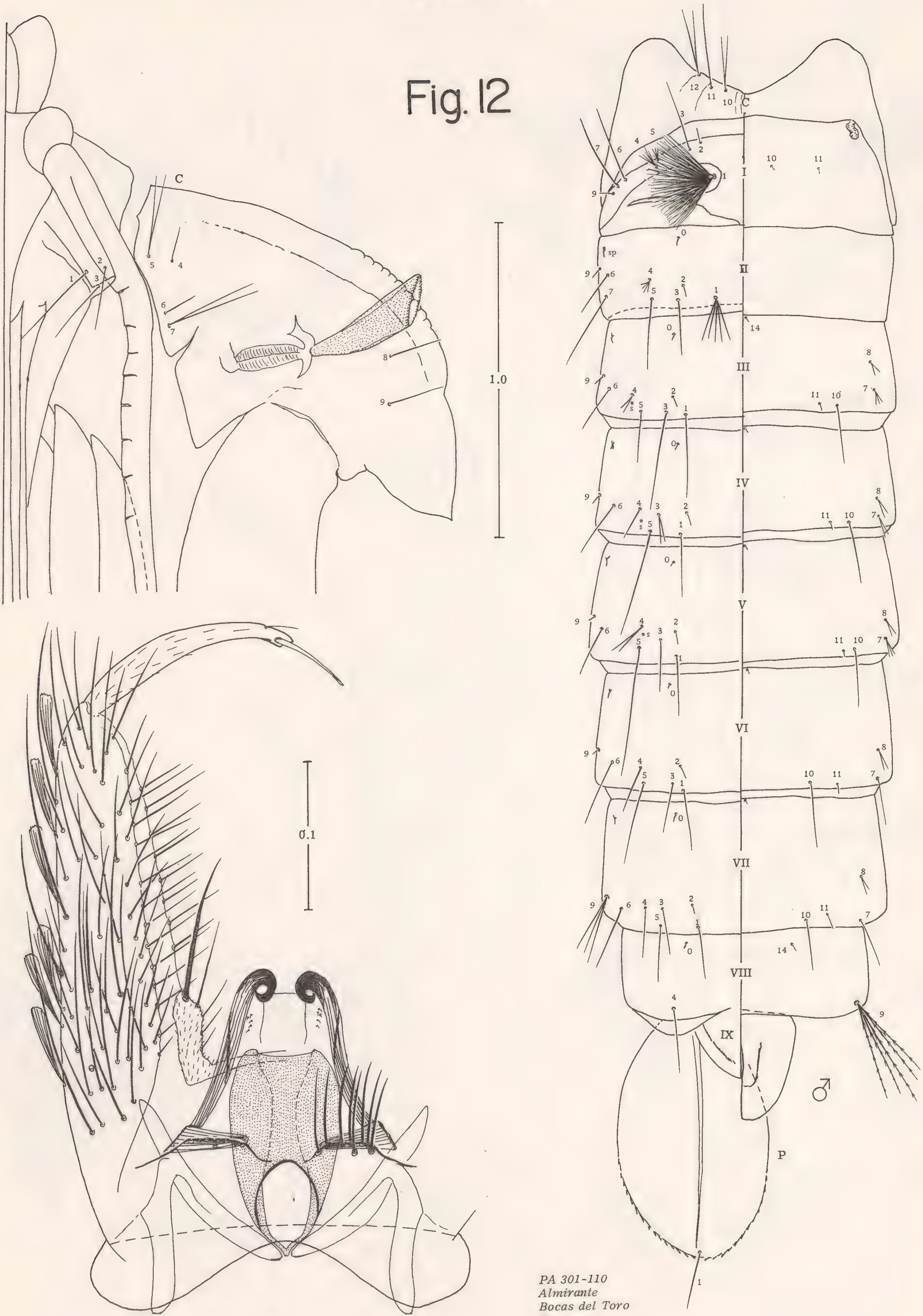
Fig. II

fulvithorax

TR 680-102
Verdant Vale
Arima, St. George
Trinidad

HOWARDINA

Fig. 12



septemstriatus

PA 301-110
Almirante
Bocas del Toro
Panama

HOWARDINA

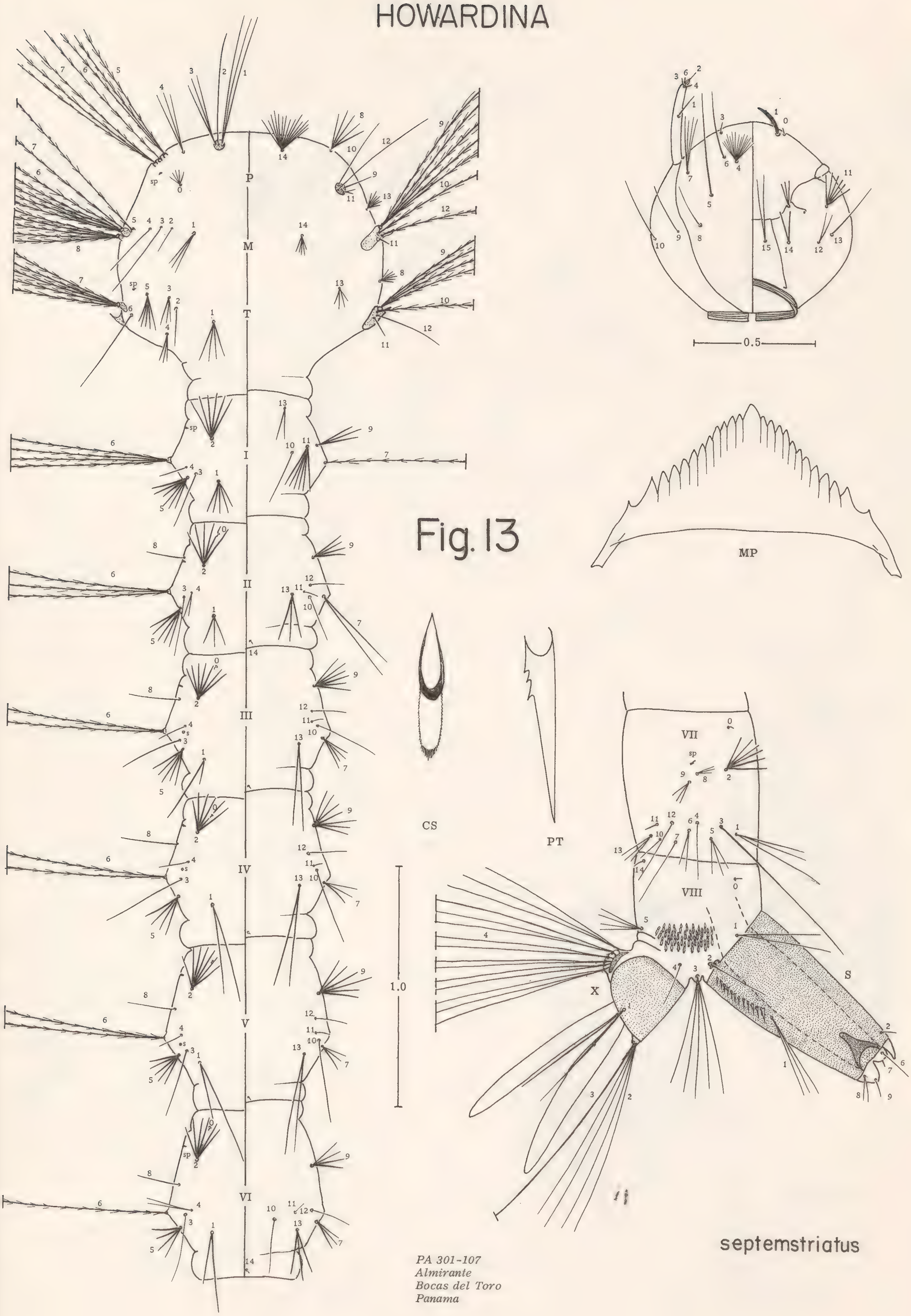


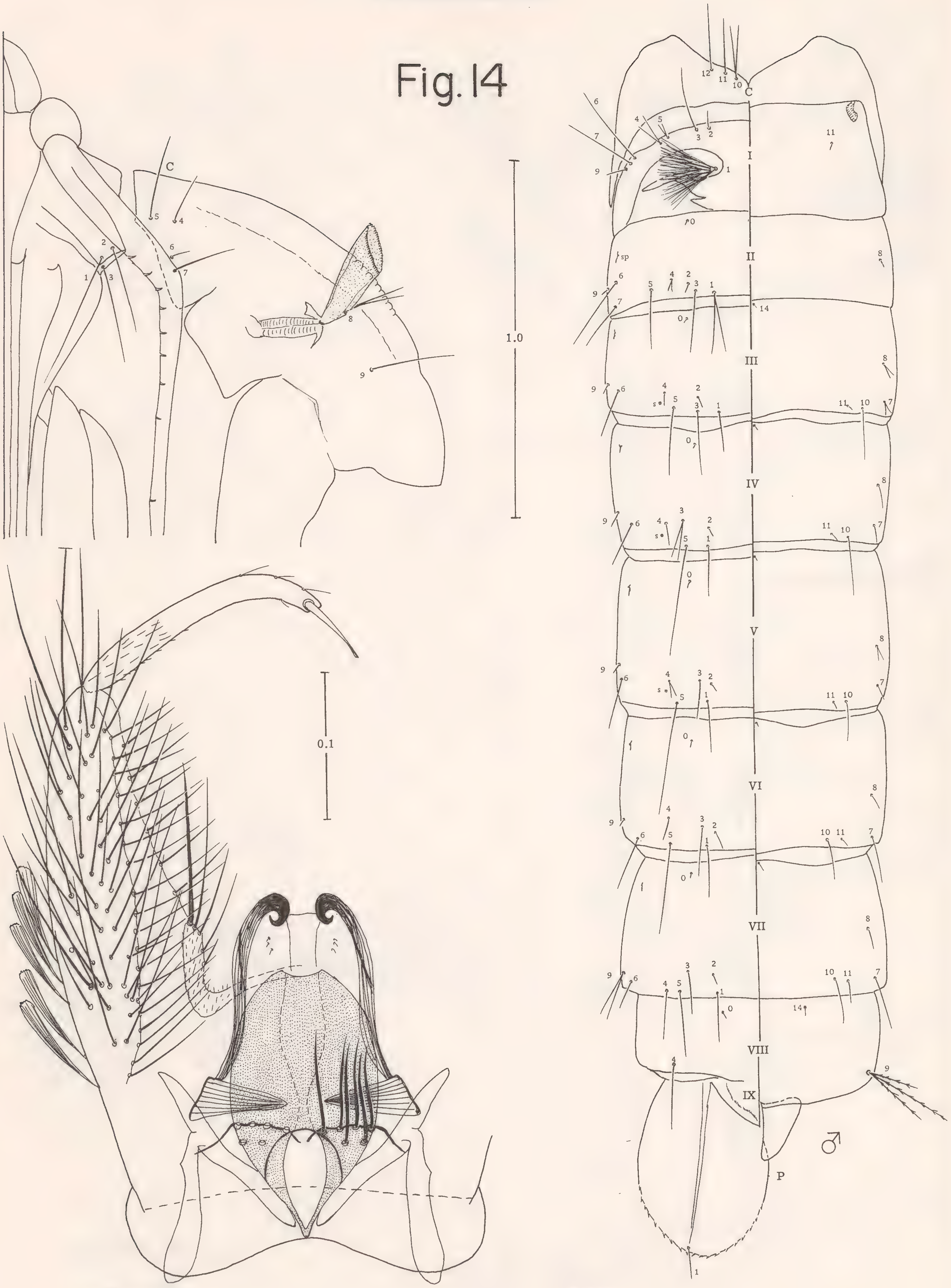
Fig. 13

PA 301-107
Almirante
Bocas del Toro
Panama

septemstriatus

HOWARDINA

Fig. 14



arborealis

Surinam

HOWARDINA

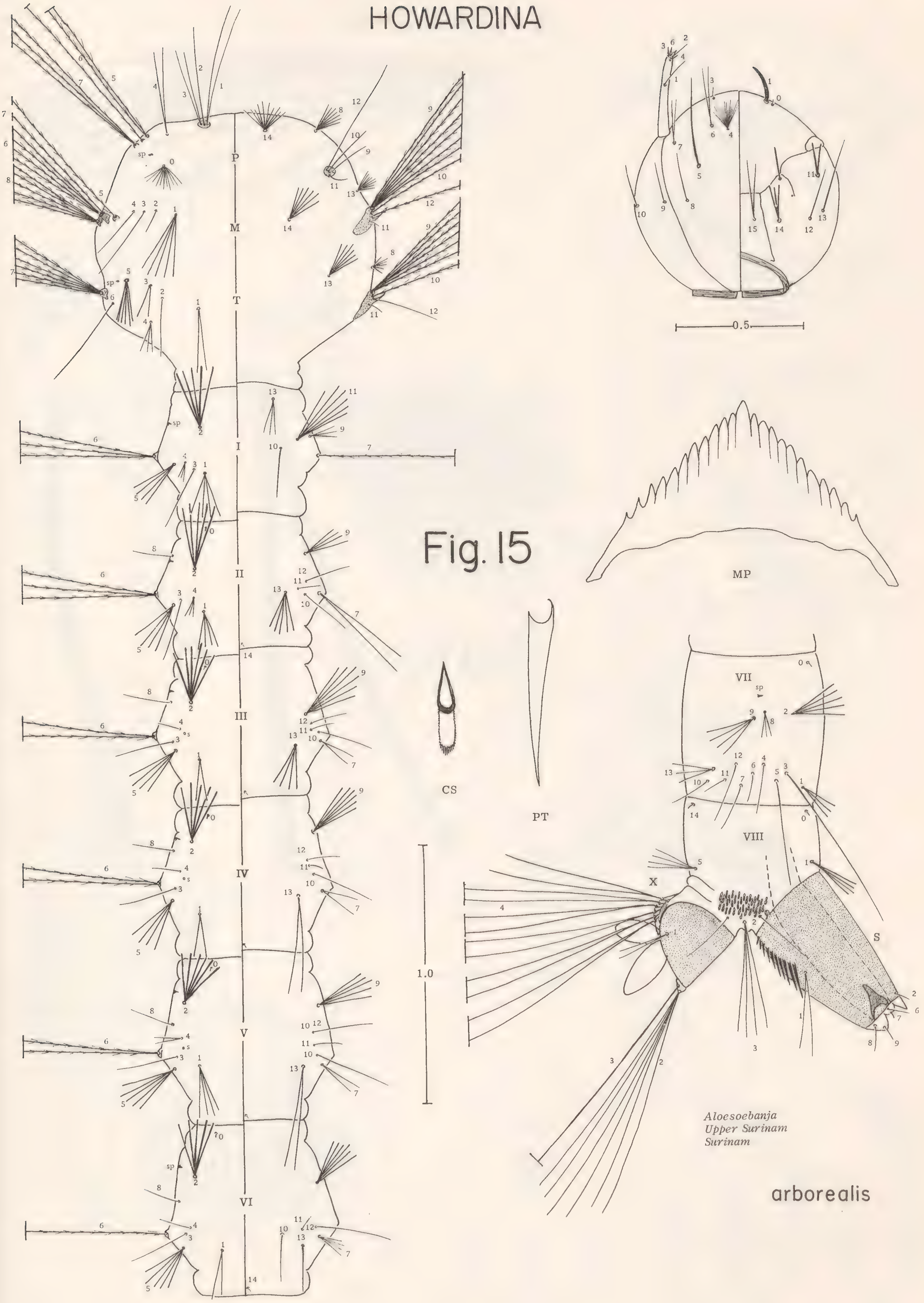


Fig. 15

Aloesoebanja
Upper Surinam
Surinam

arborealis

HOWARDINA

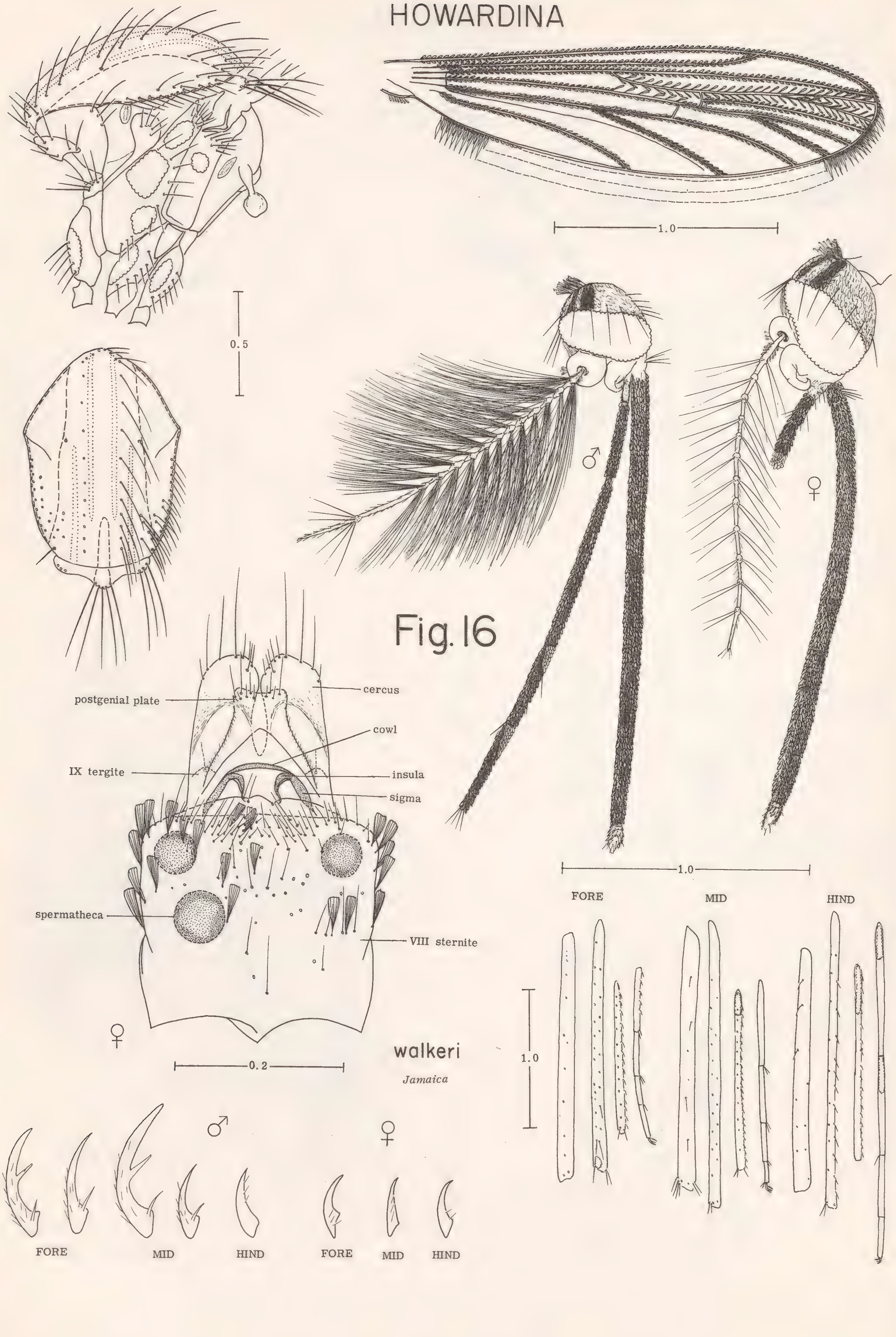


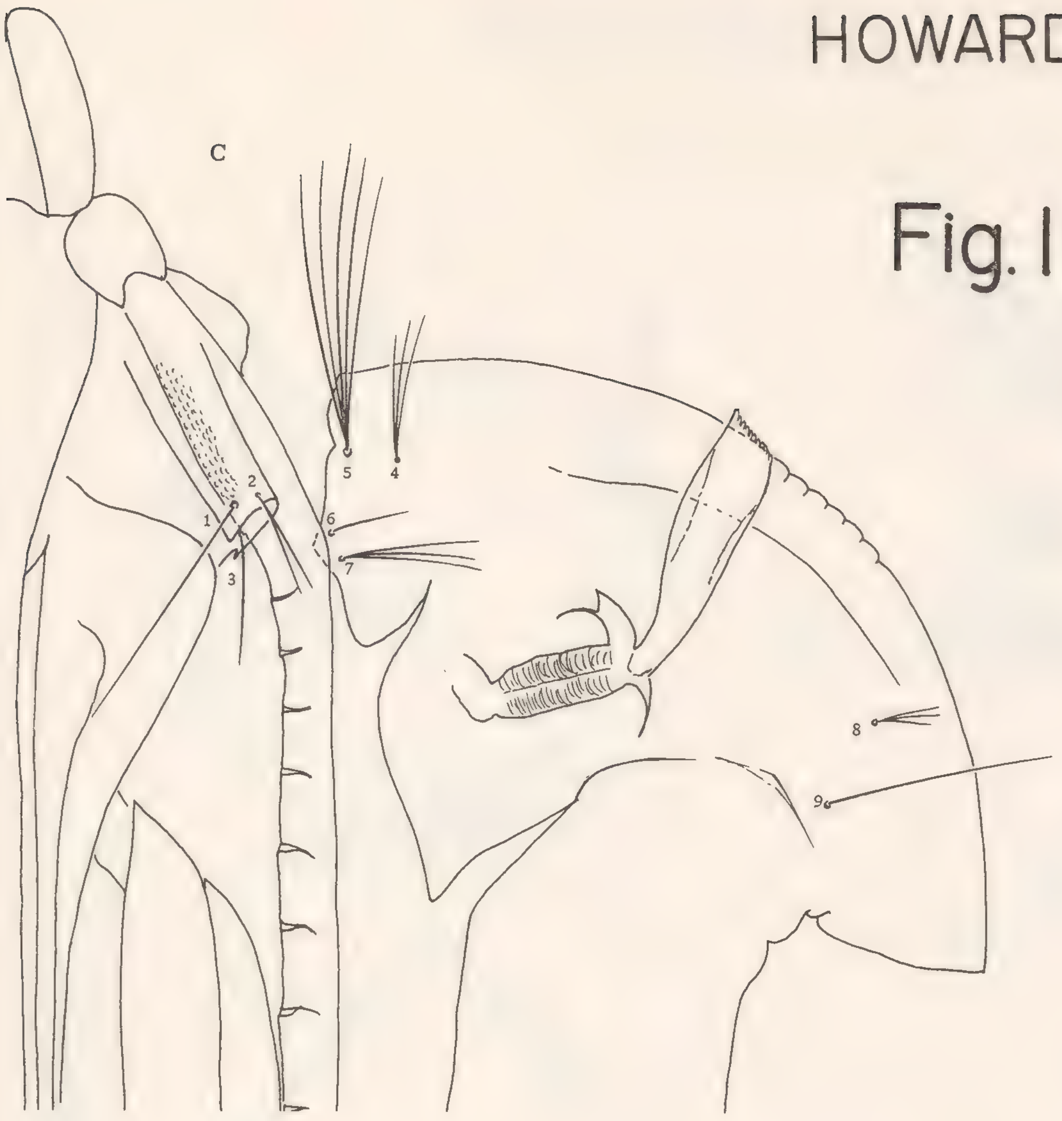
Fig. 16

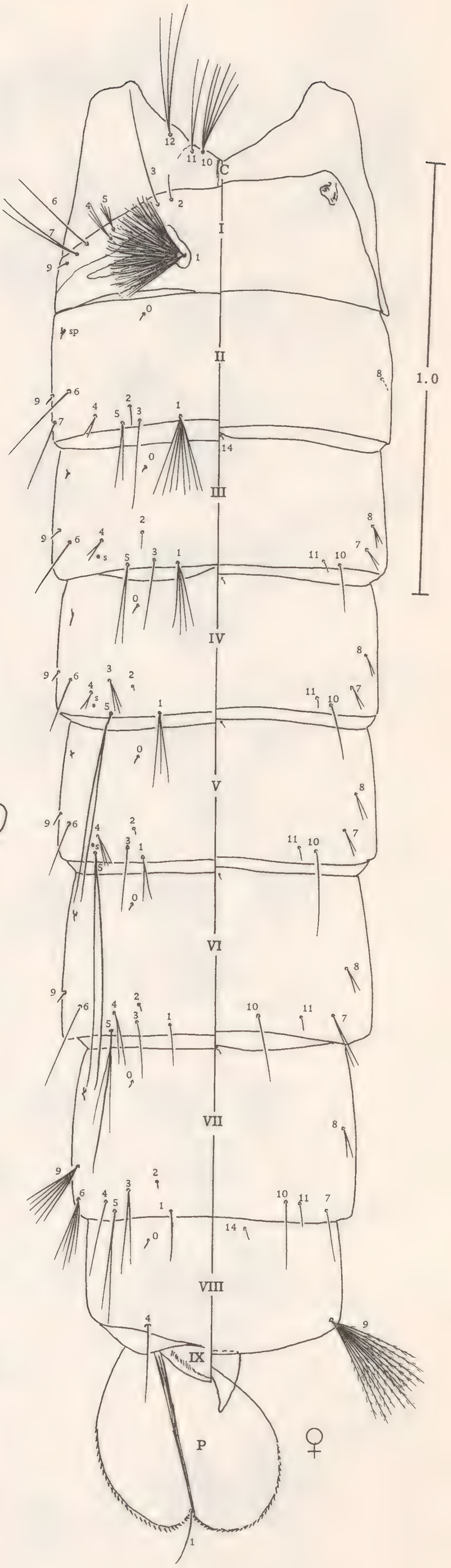
walkeri

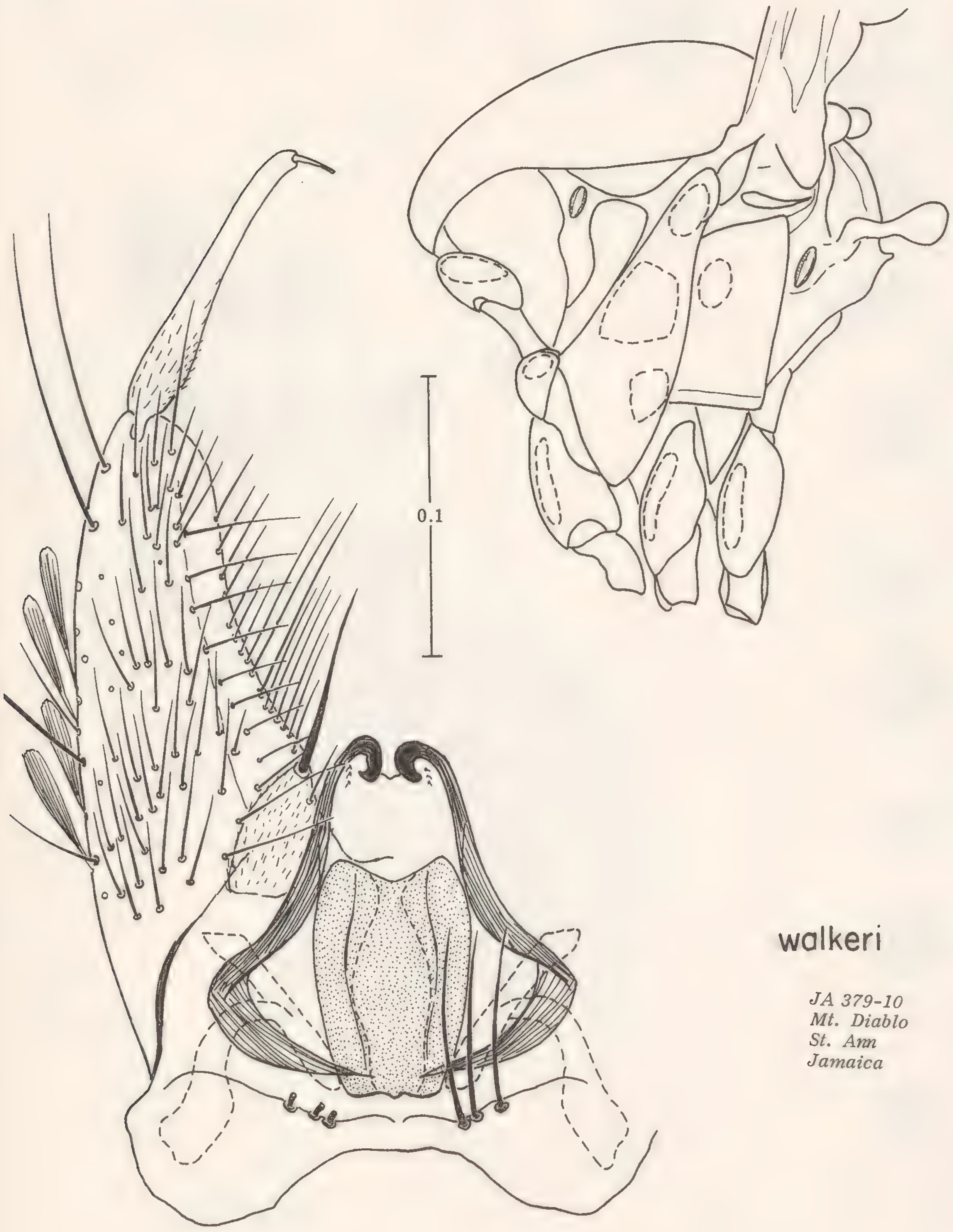
Jamaica

HOWARDINA

Fig. 17







walkeri

JA 379-10
Mt. Diablo
St. Ann
Jamaica

HOWARDINA

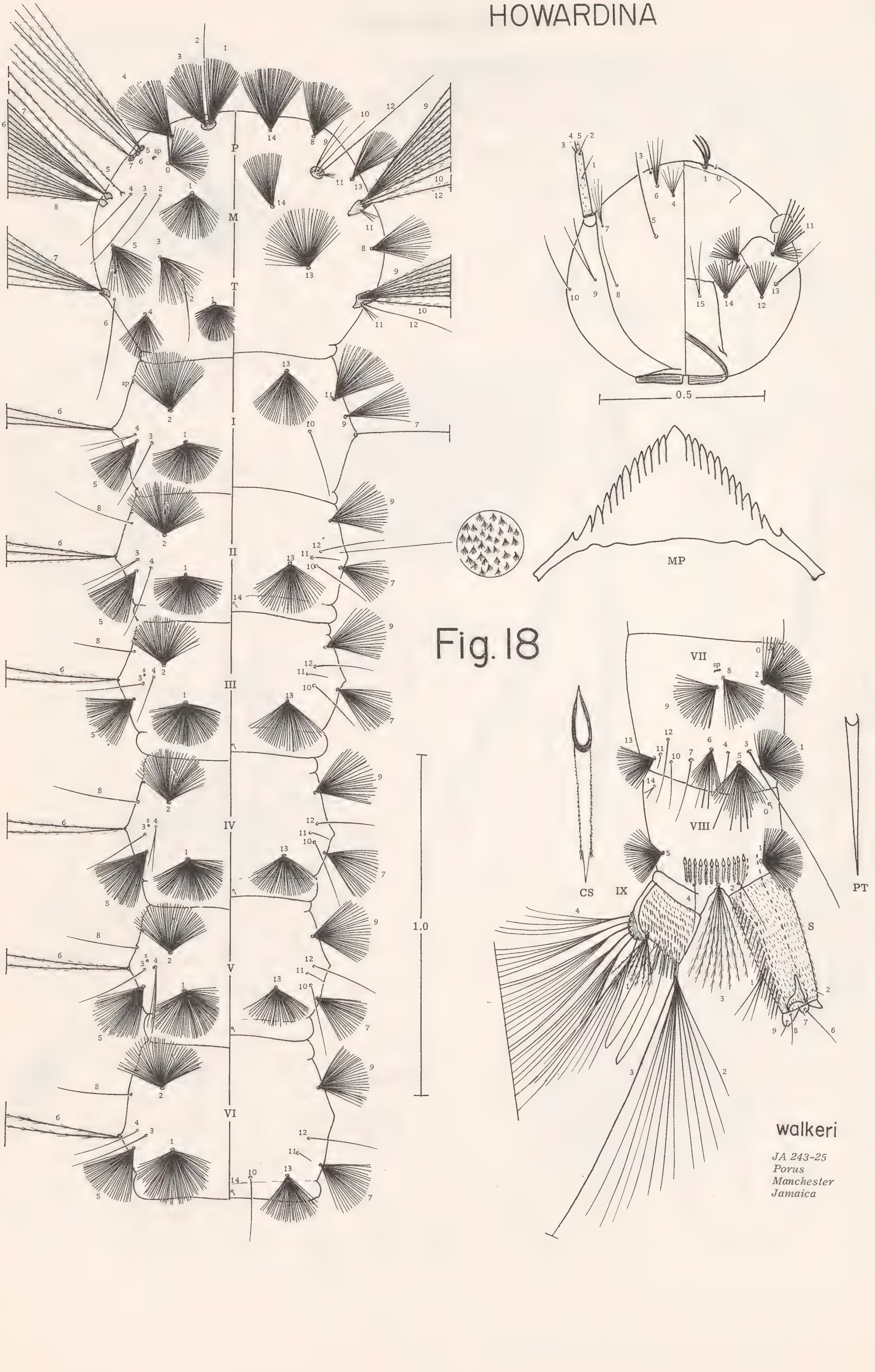


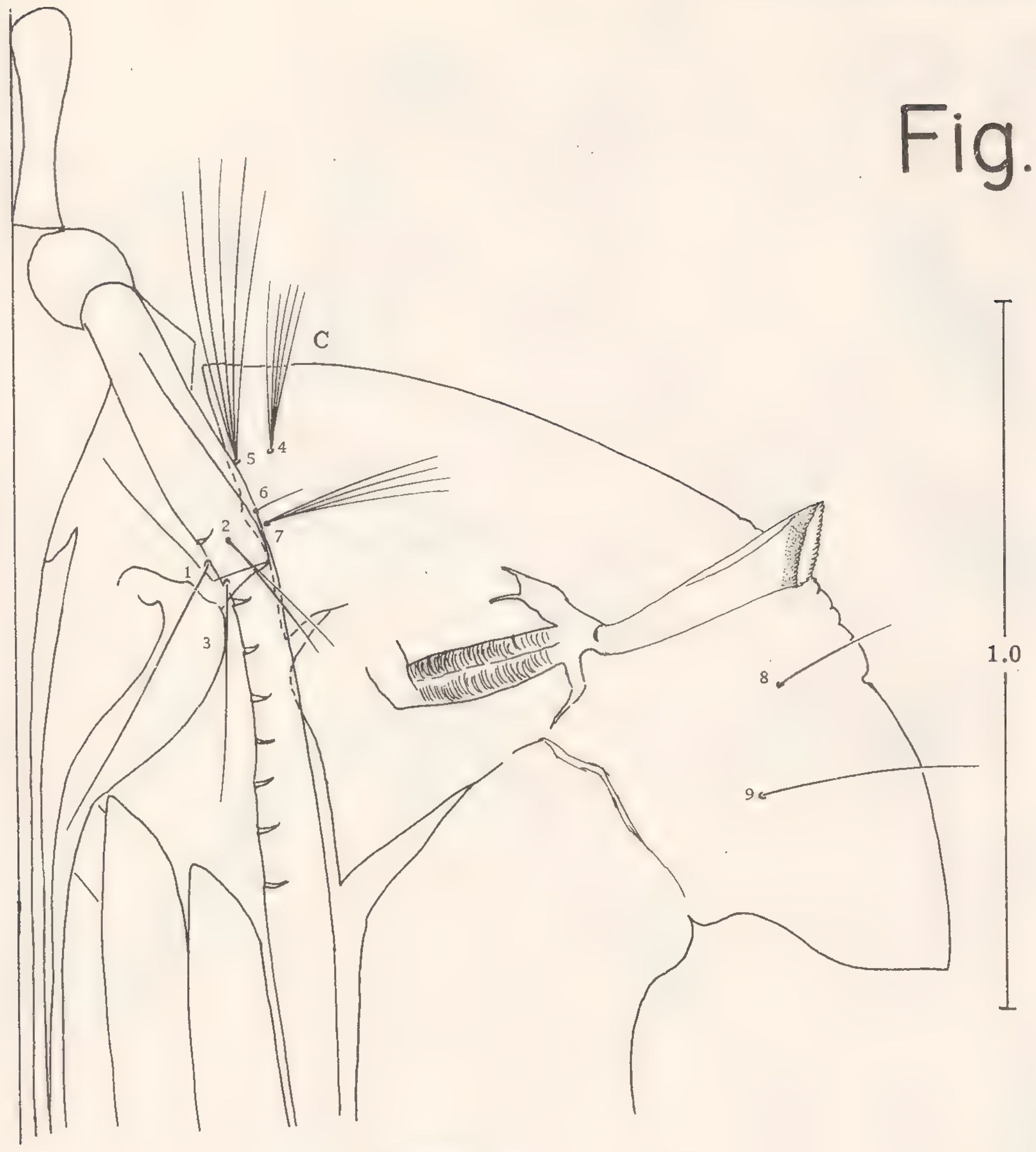
Fig. 18

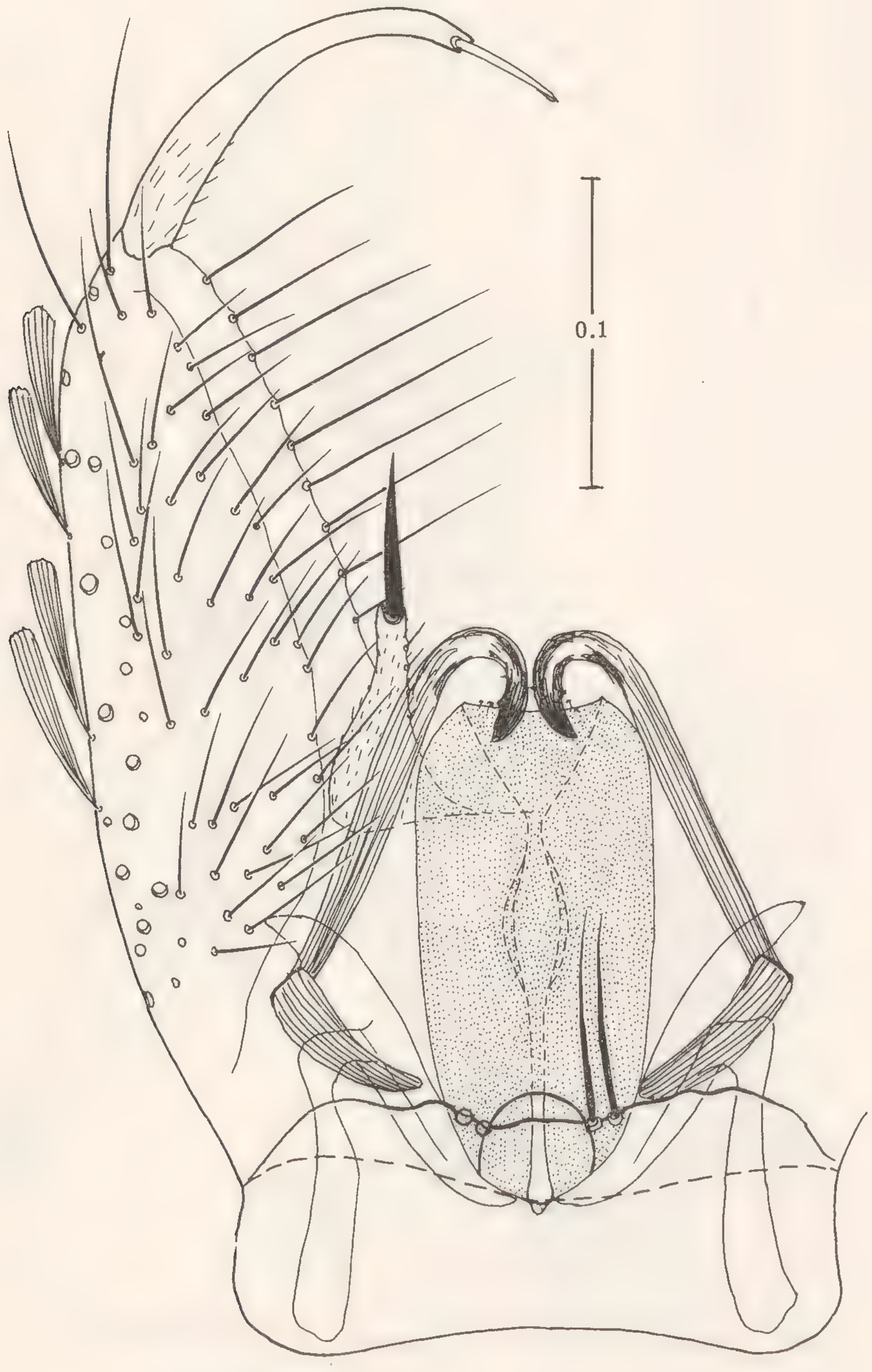
walkeri

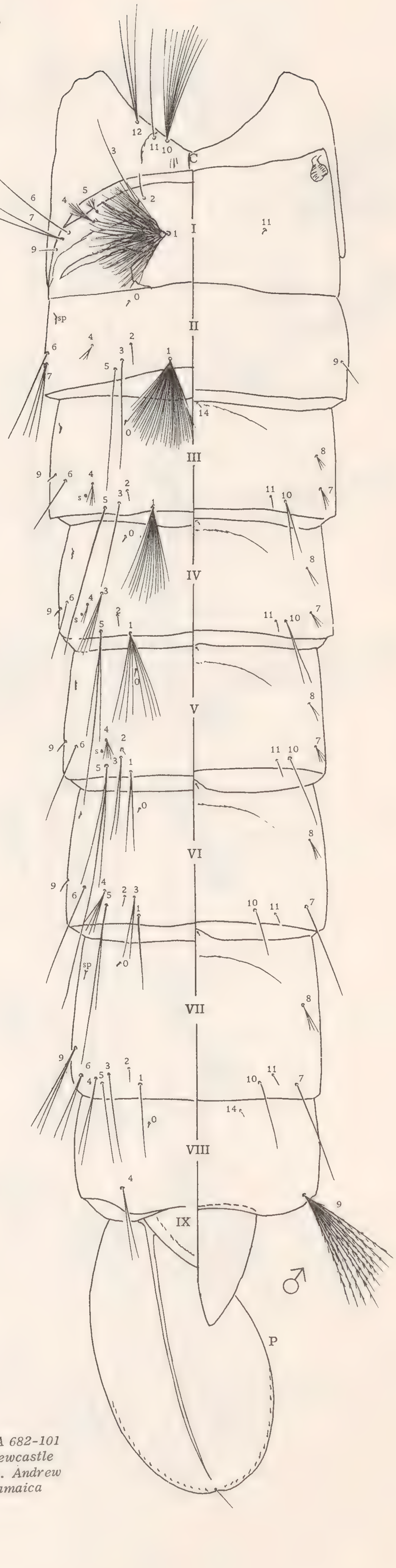
JA 243-25
Porus
Manchester
Jamaica

HOWARDINA

Fig. 19







aurites

JA 682-101
Newcastle
St. Andrew
Jamaica

HOWARDINA

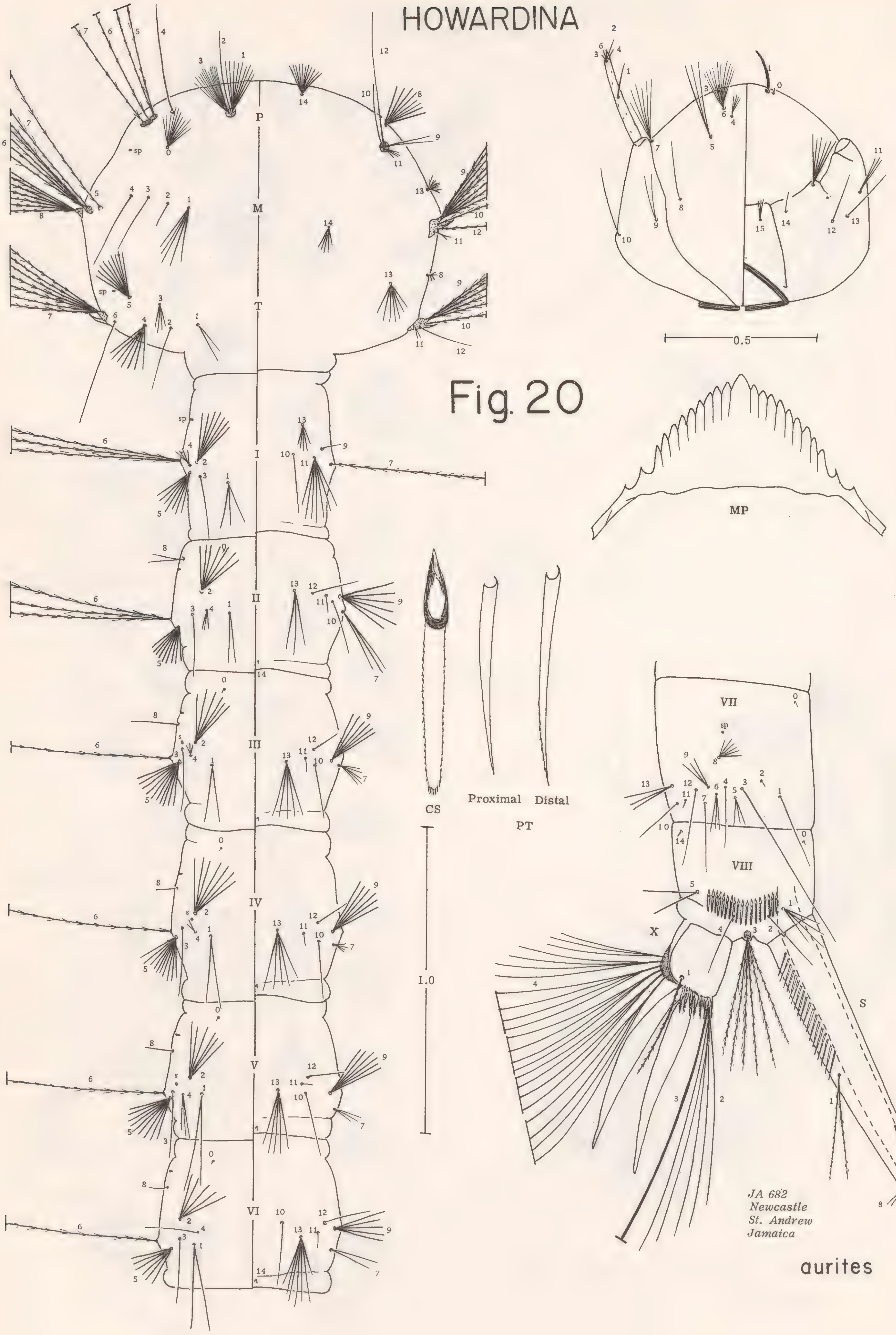
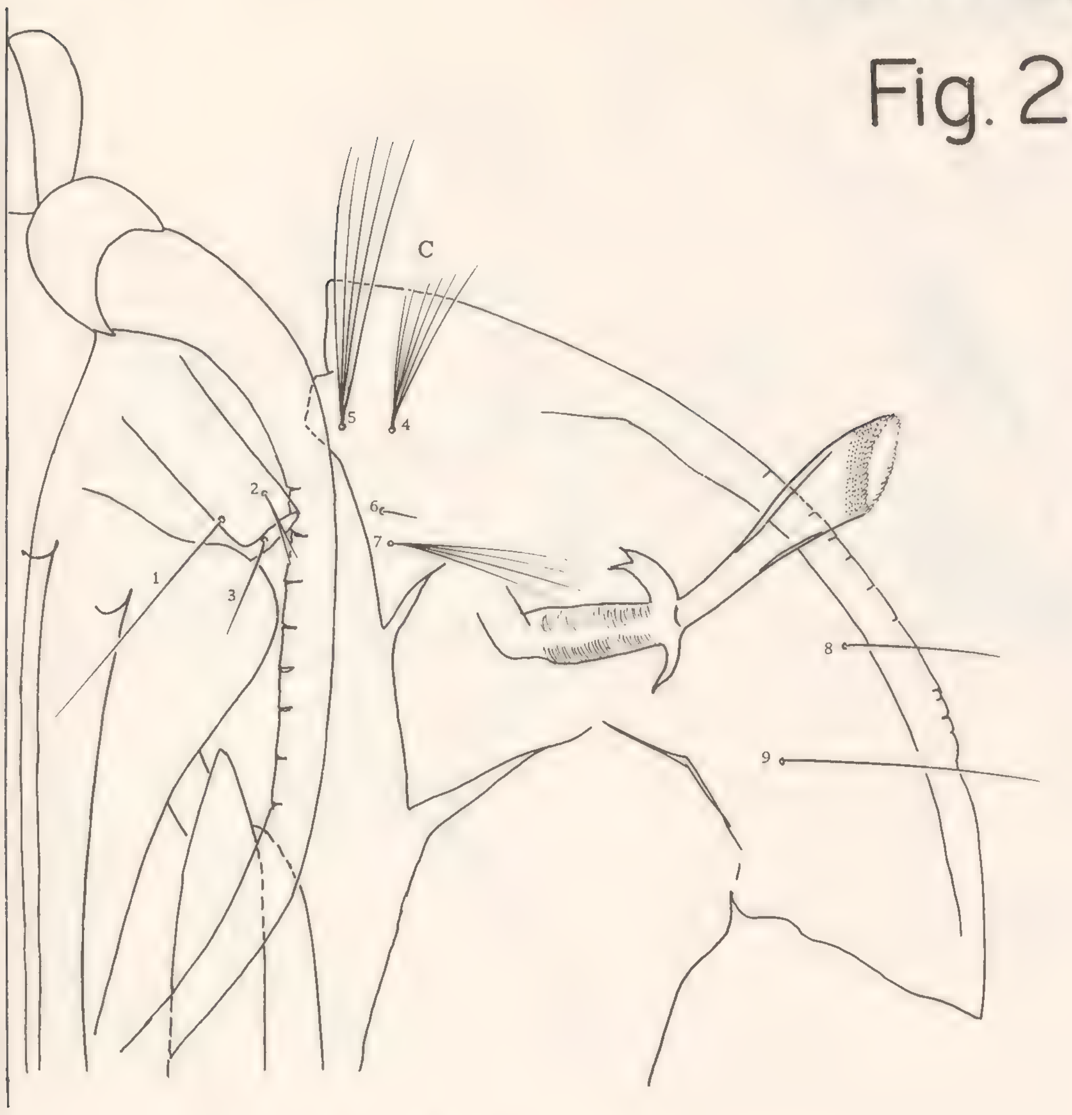


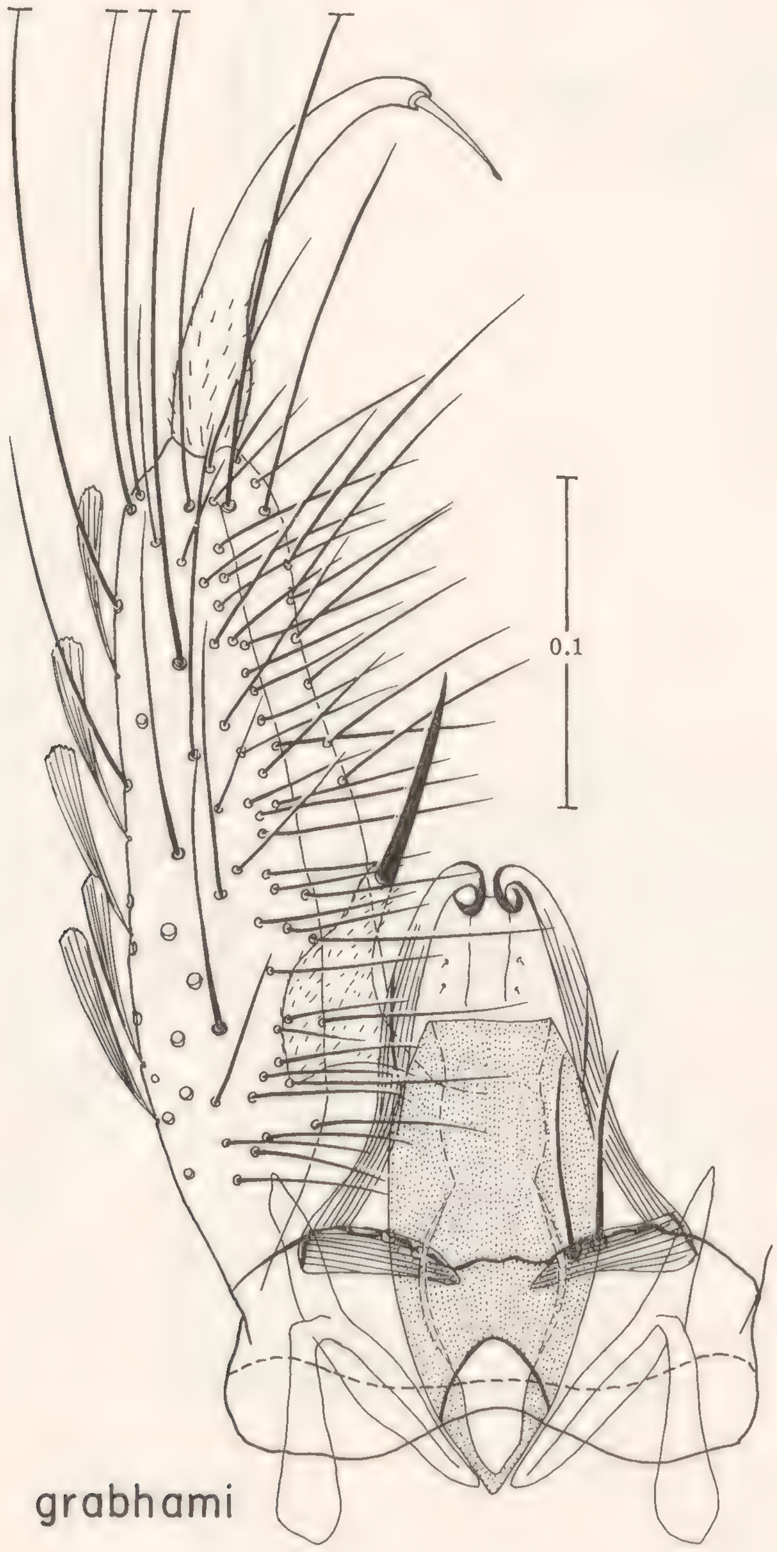
Fig. 20

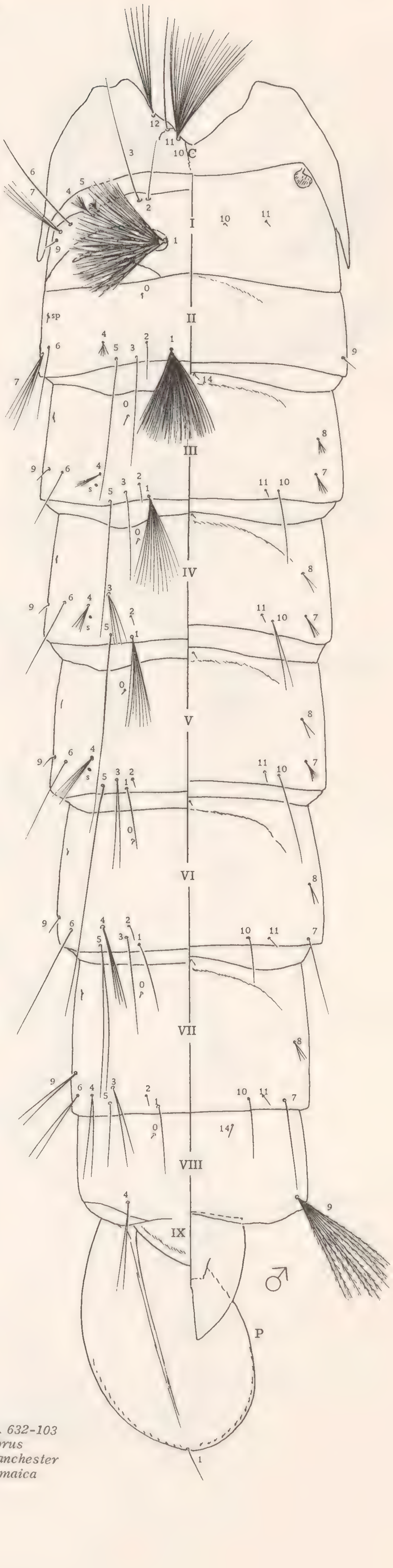
aurites

HOWARDINA

Fig. 21







grabhami

JA 632-103
Porus
Manchester
Jamaica

HOWARDINA

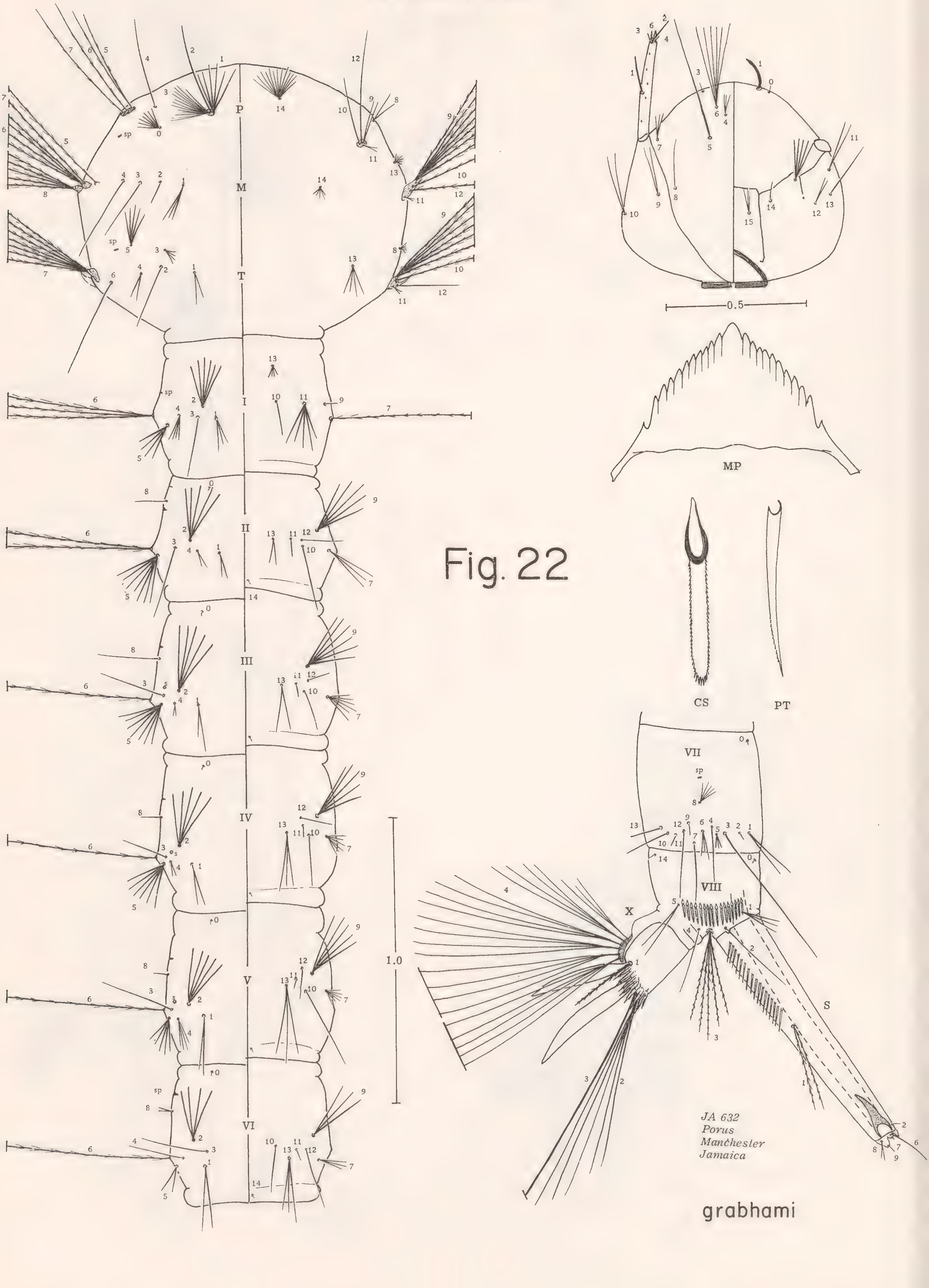


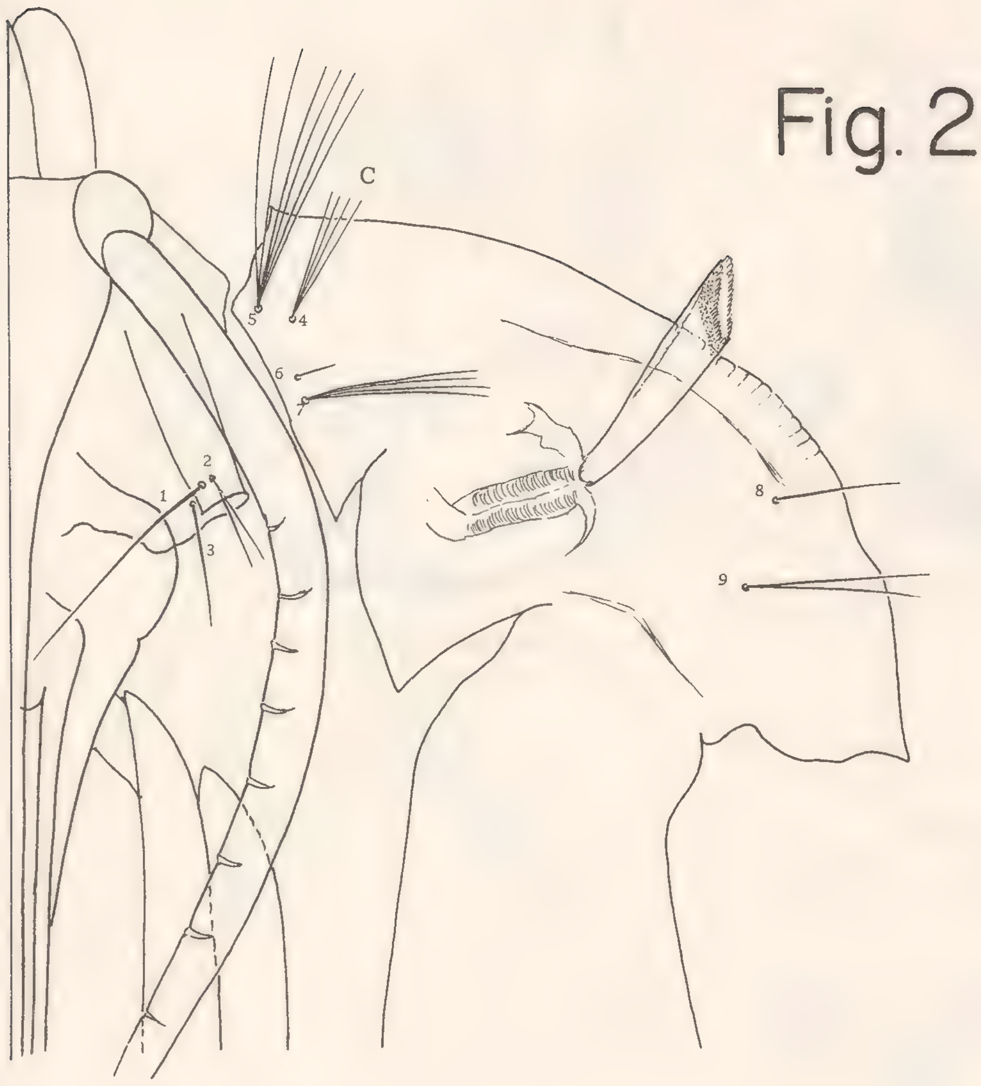
Fig. 22

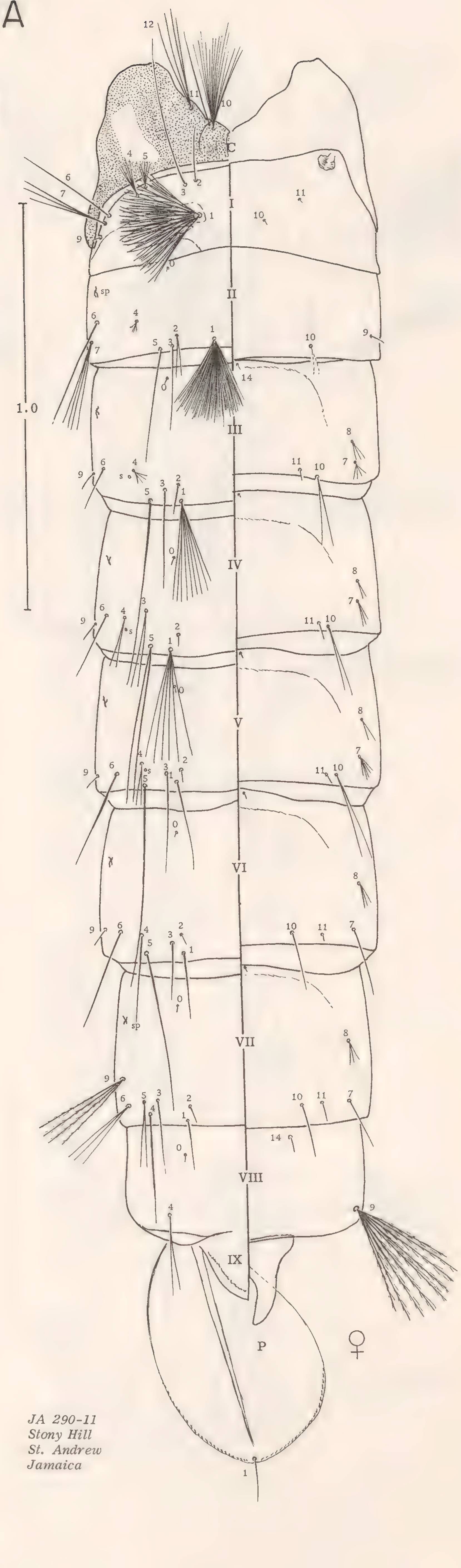
JA 632
Porus
Manchester
Jamaica

grabhami

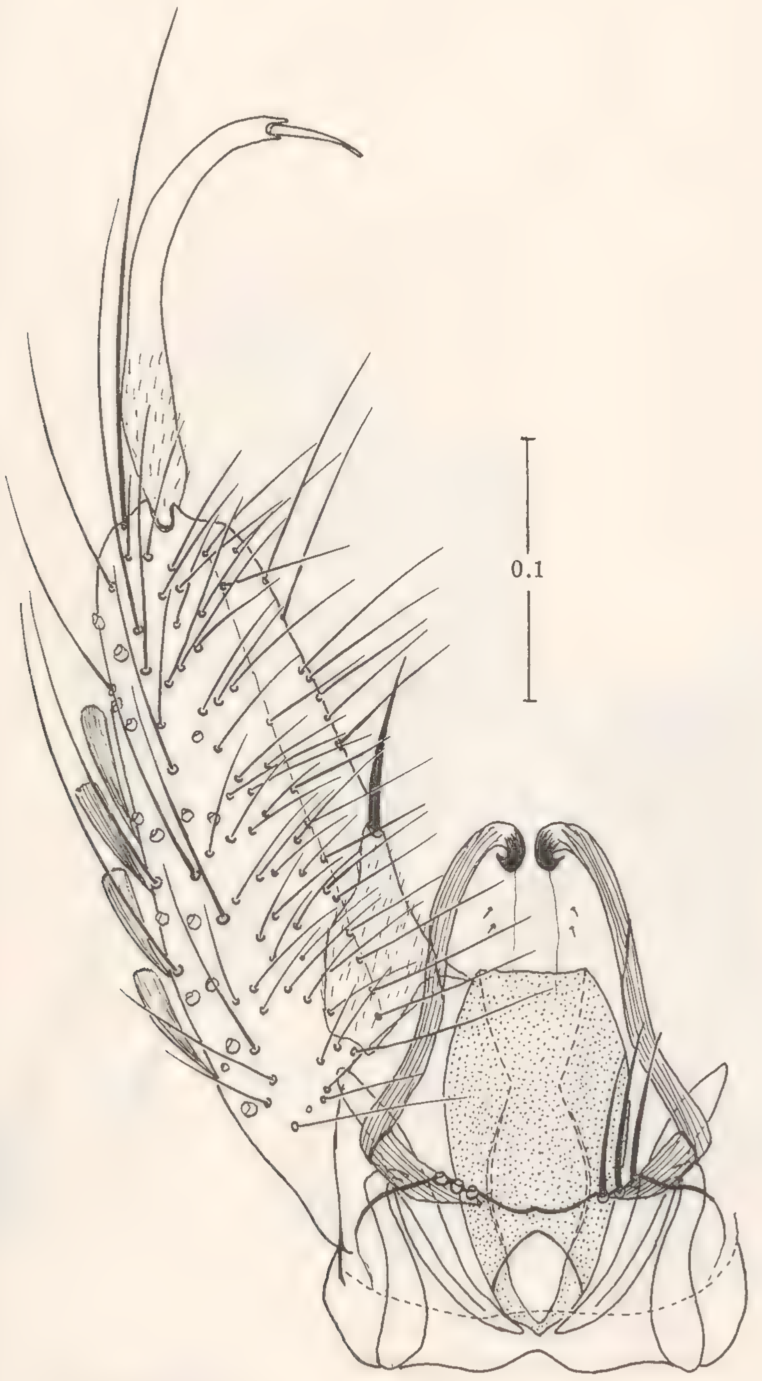
HOWARDINA

Fig. 23



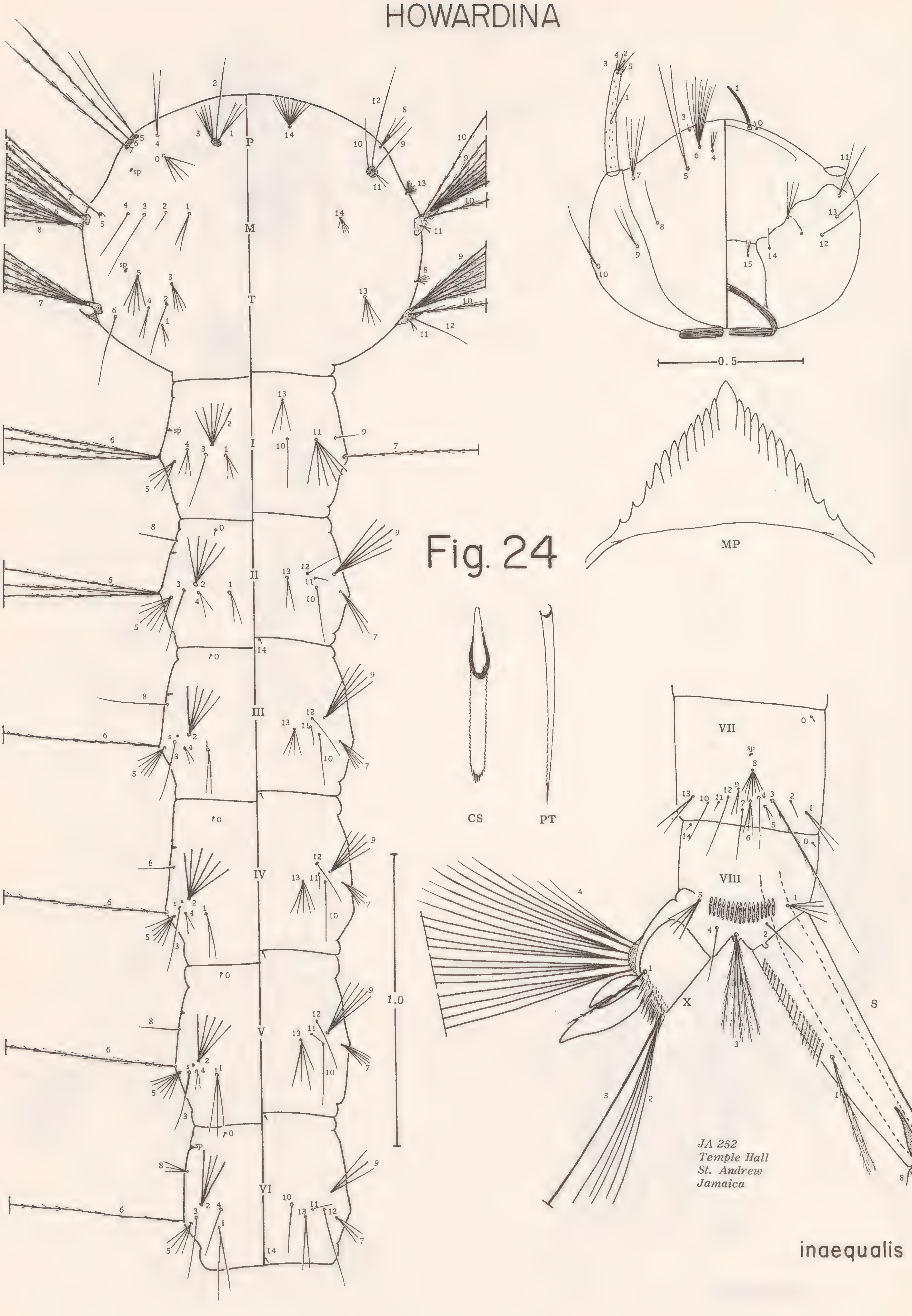


JA 290-11
Stony Hill
St. Andrew
Jamaica



inaequalis

HOWARDINA



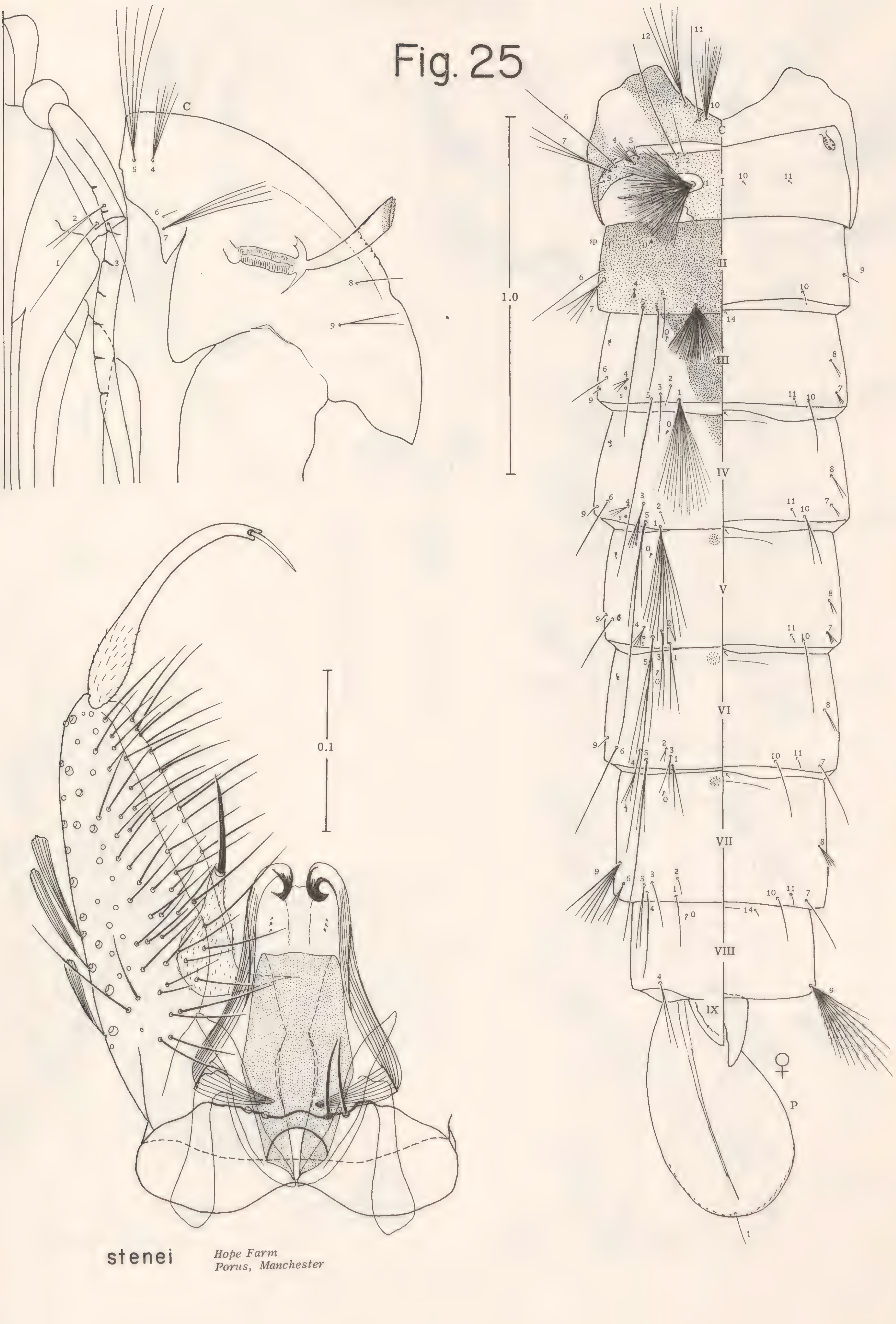
JA 252
Temple Hall
St. Andrew
Jamaica

Fig. 24

inaequalis

HOWARDINA

Fig. 25



stenei *Hope Farm*
Porus, Manchester

HOWARDINA

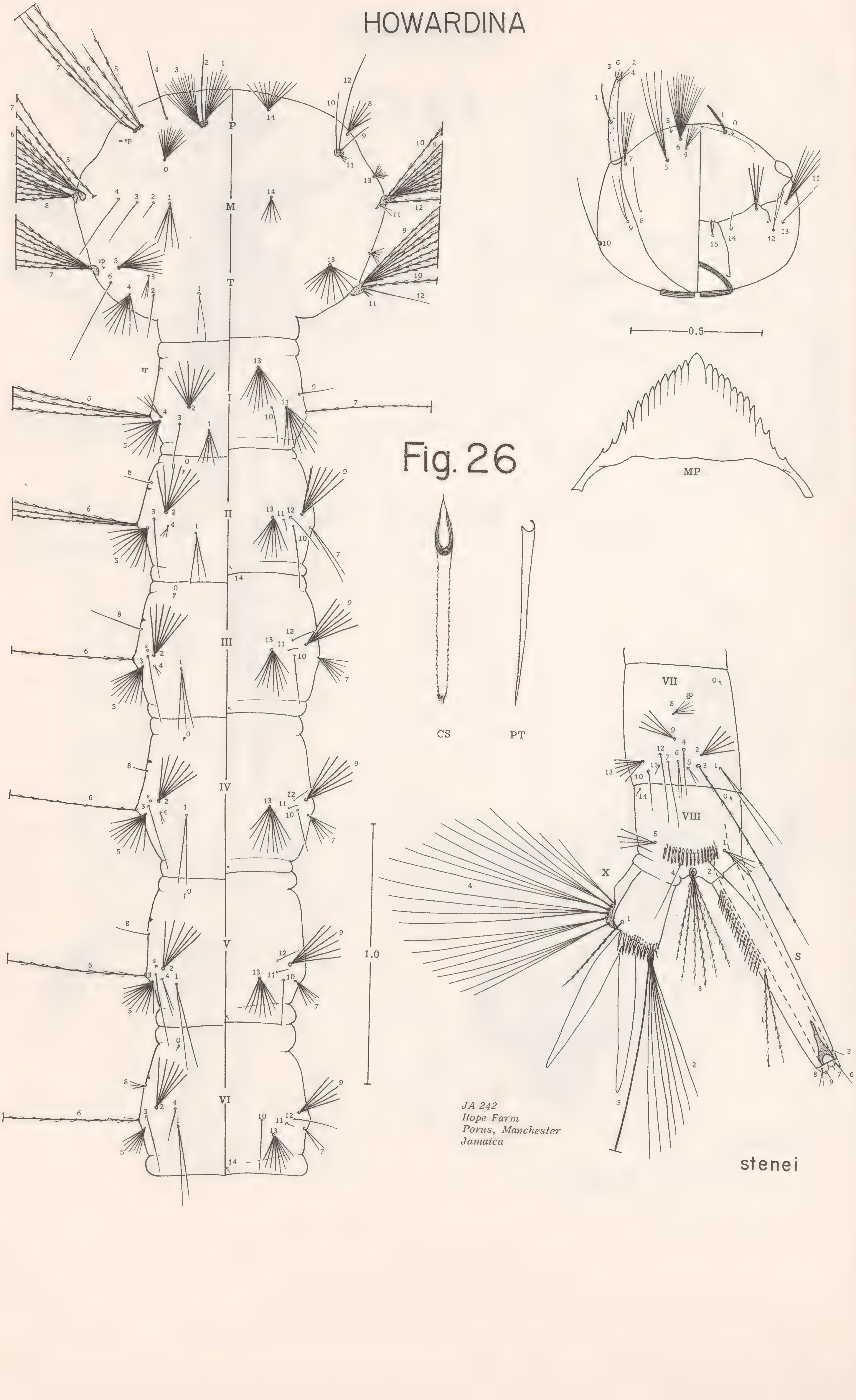


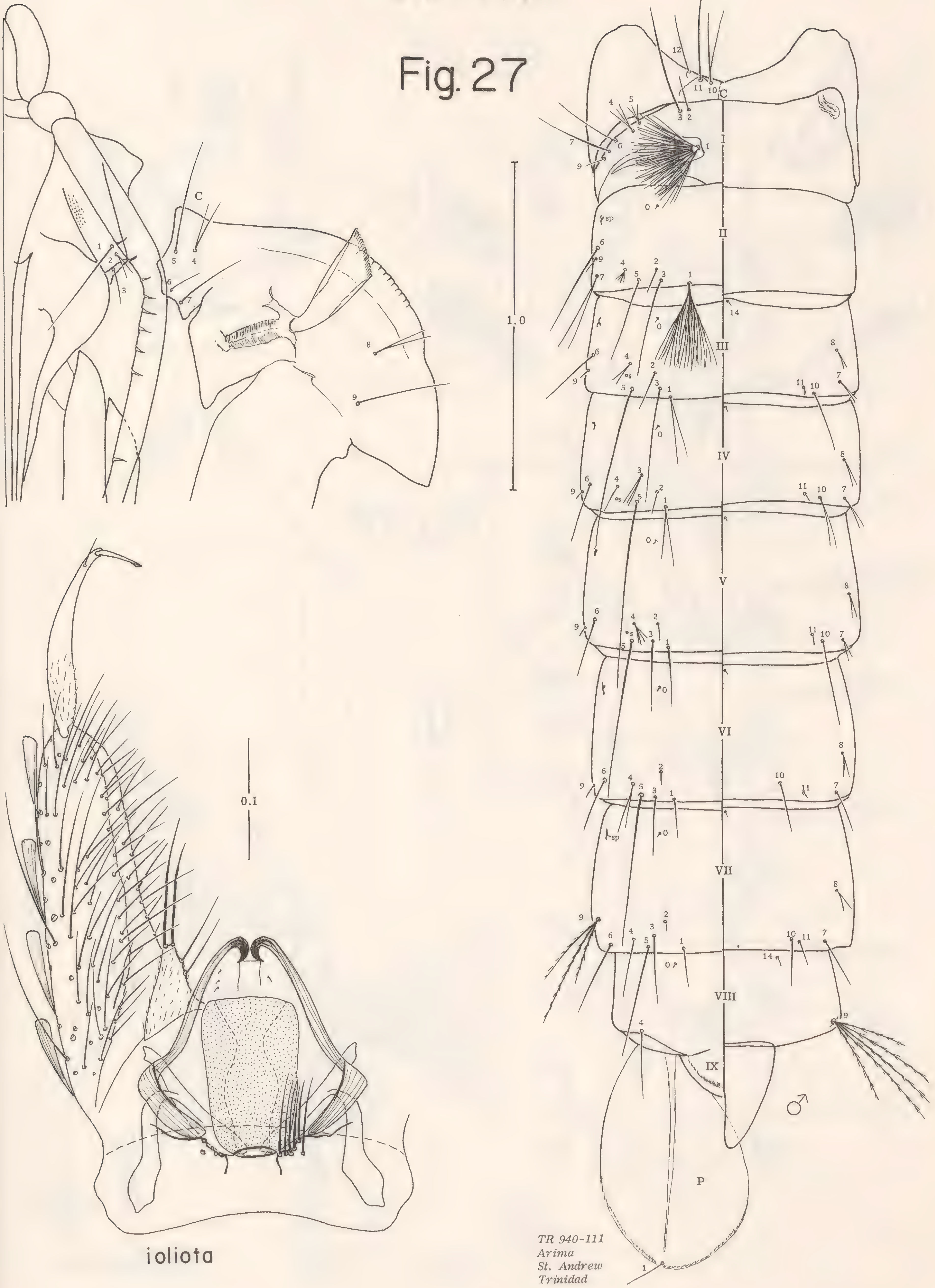
Fig. 26

JA 242
Hope Farm
Porus, Manchester
Jamaica

stenei

HOWARDINA

Fig. 27



ioliota

TR 940-111
Arima
St. Andrew
Trinidad

HOWARDINA

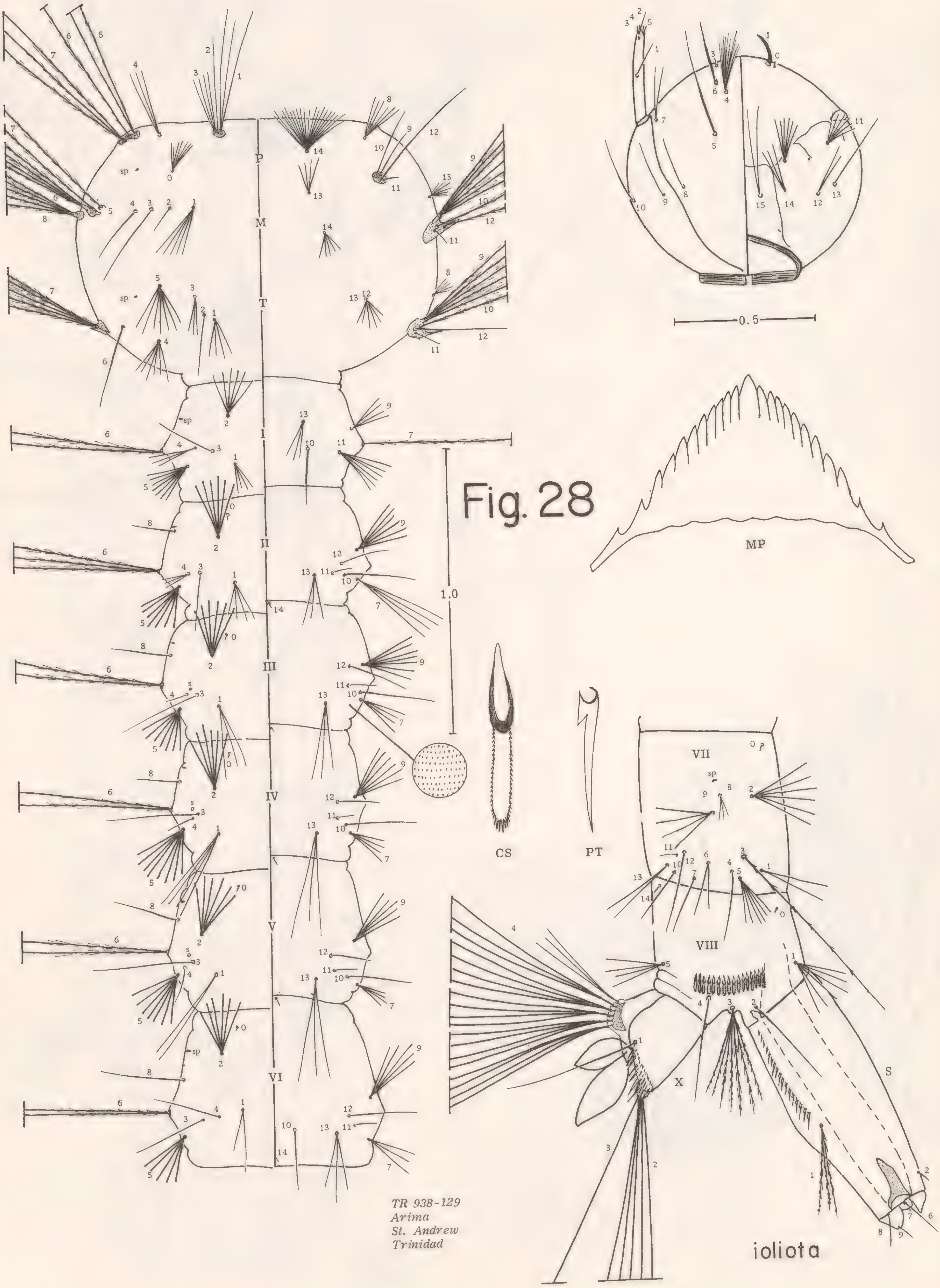


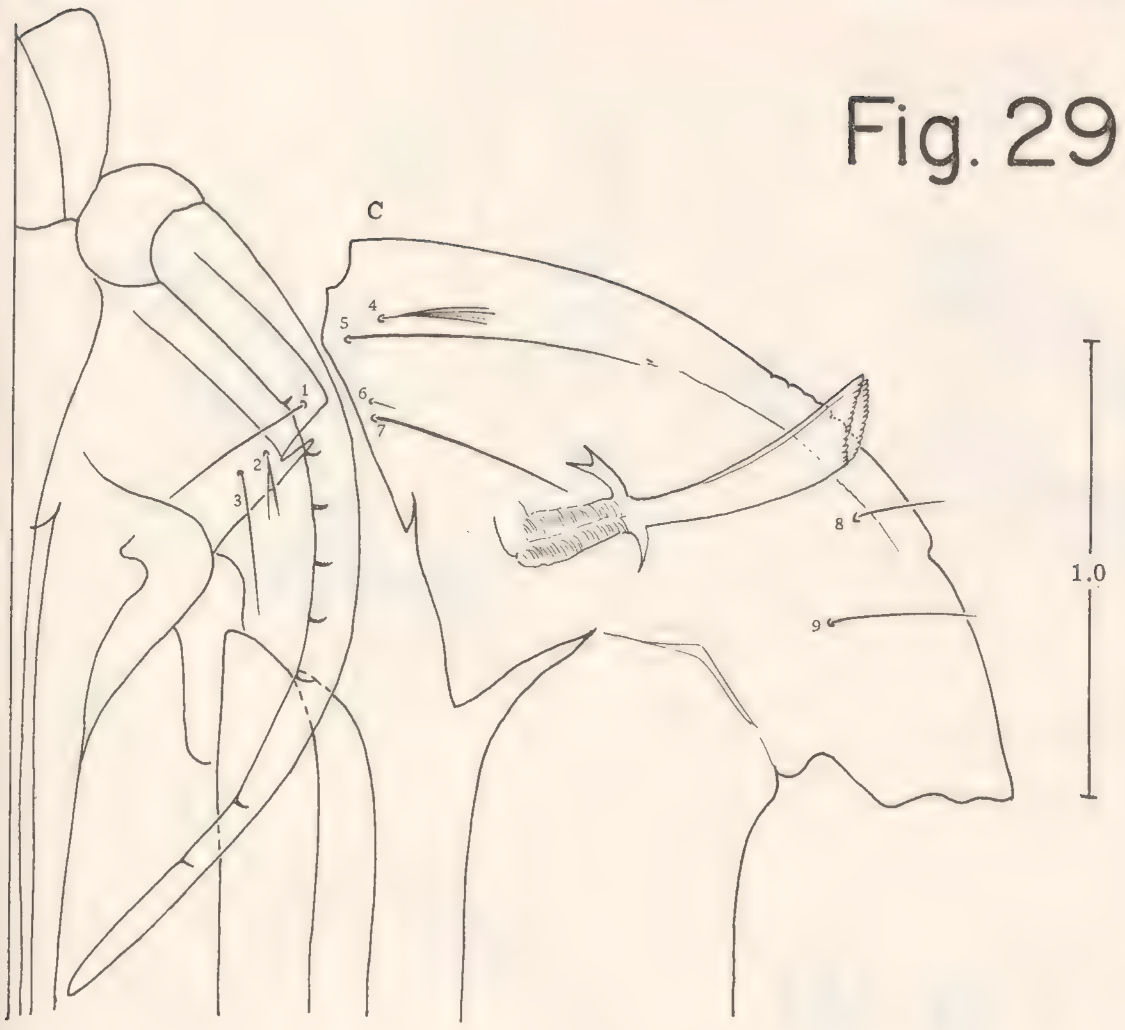
Fig. 28

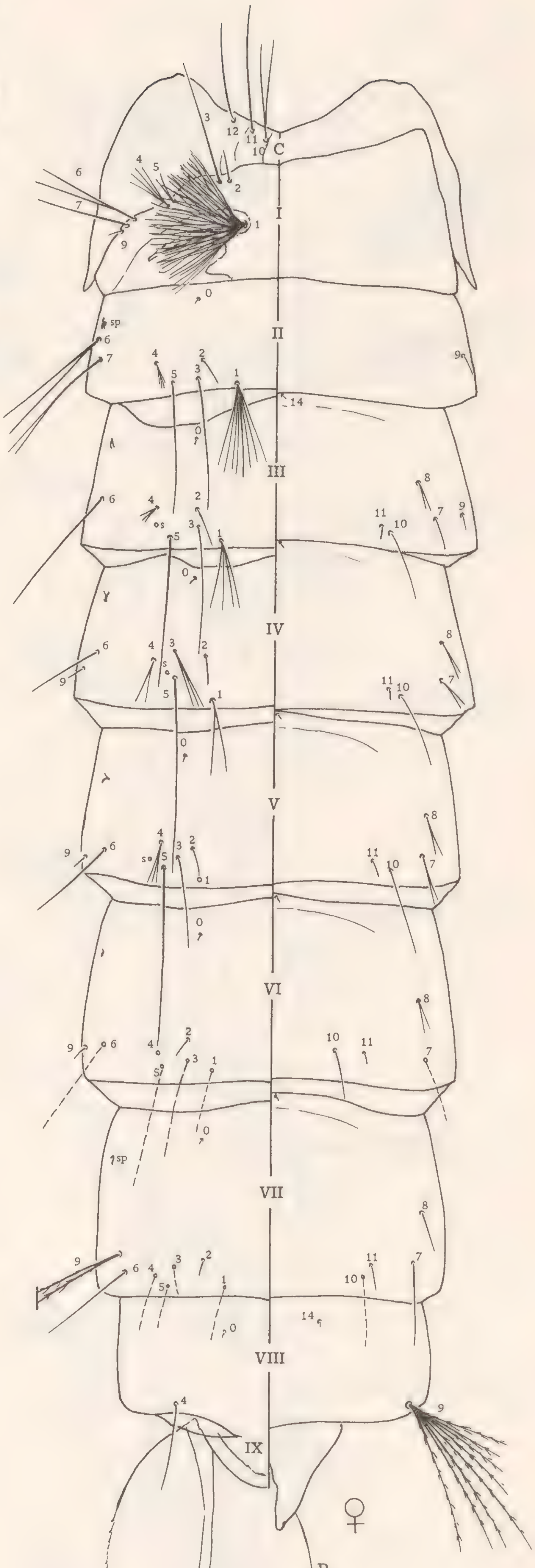
TR 938-129
Arima
St. Andrew
Trinidad

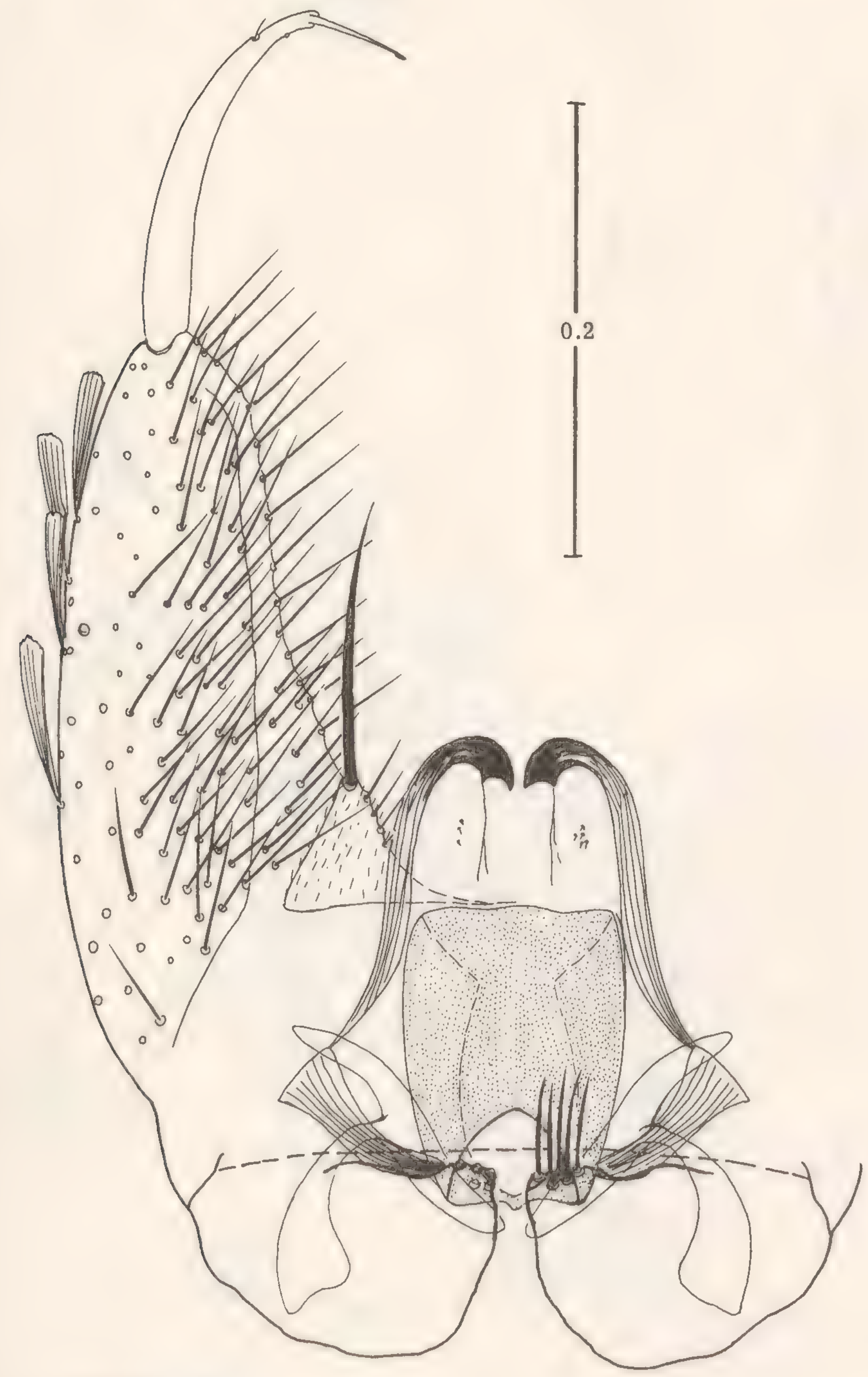
ioliota

HOWARDINA

Fig. 29



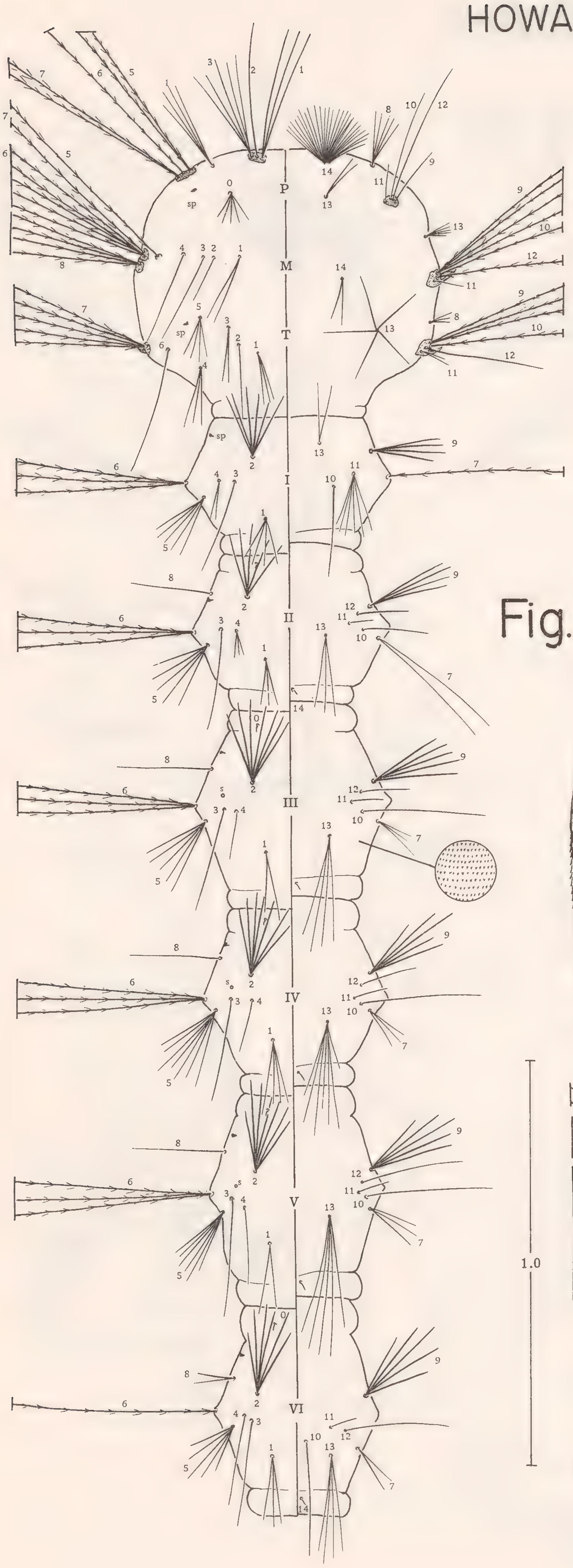




cozumelensis

Island of Cozumel
Yucatan
Mexico

HOWARDINA



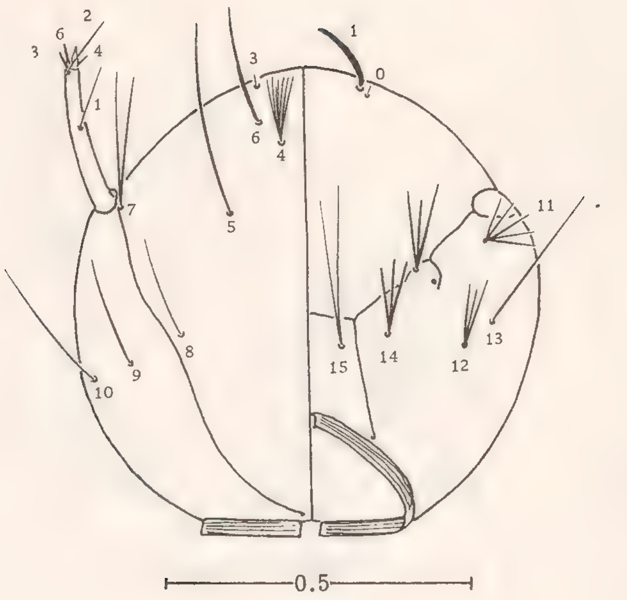
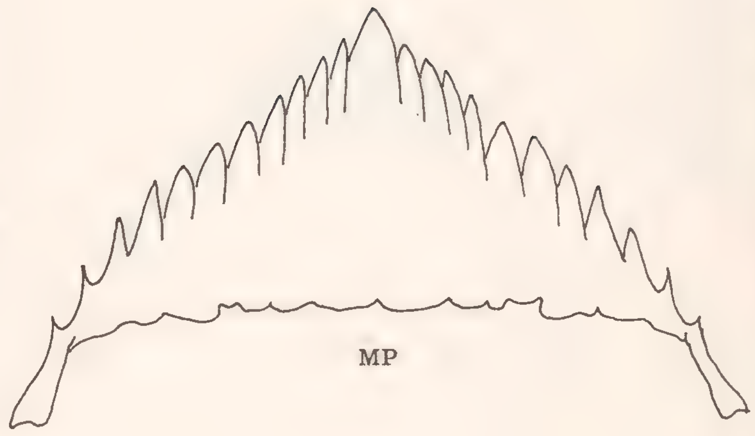
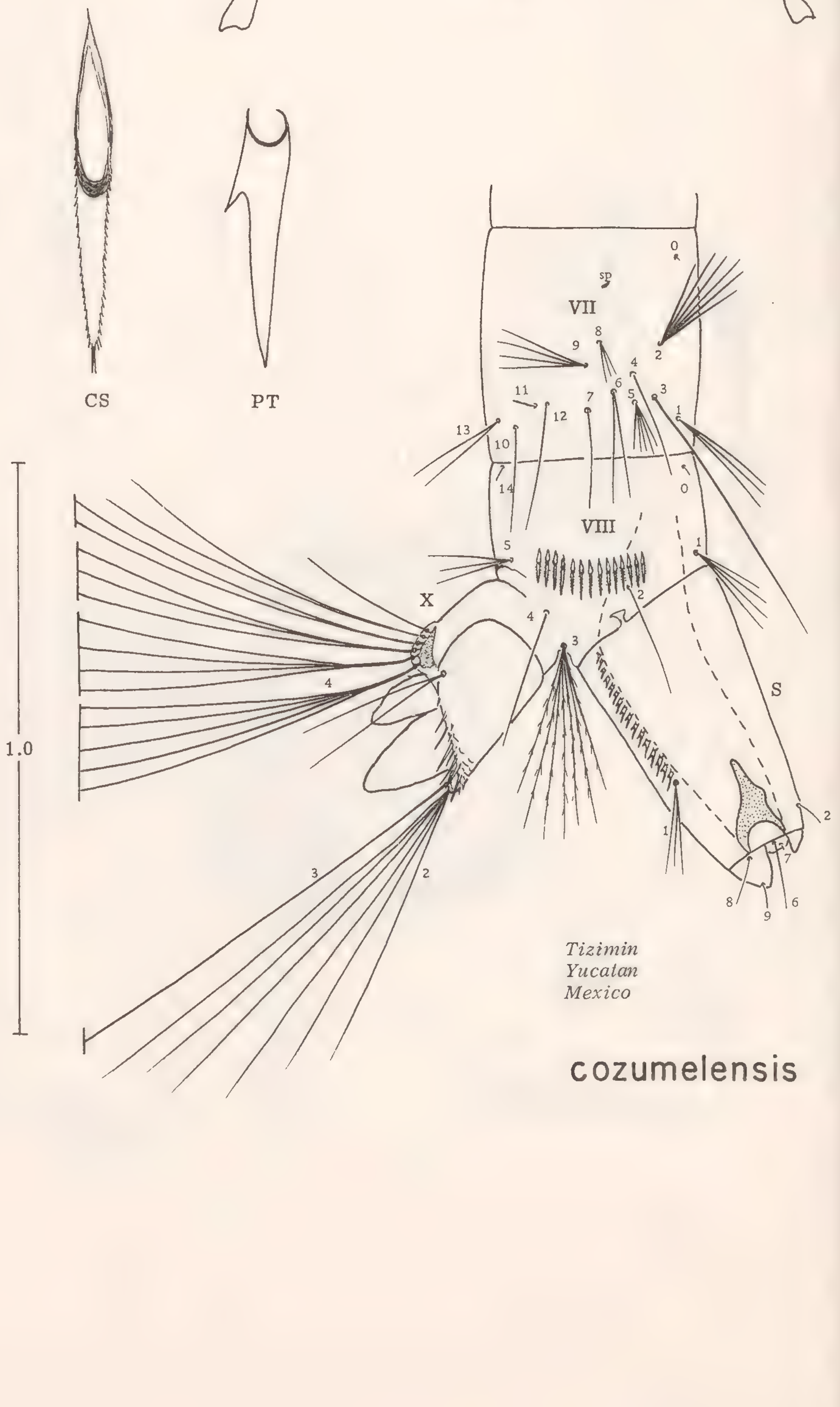


Fig. 30



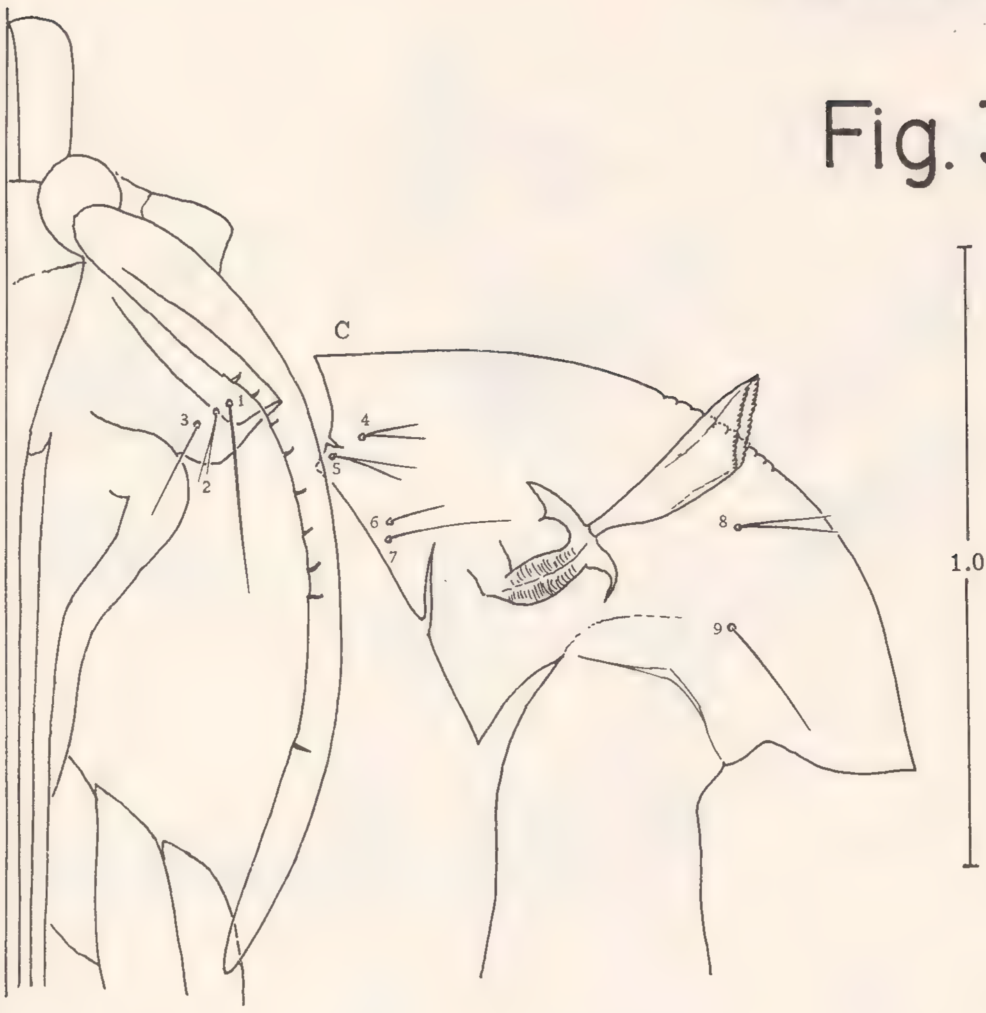


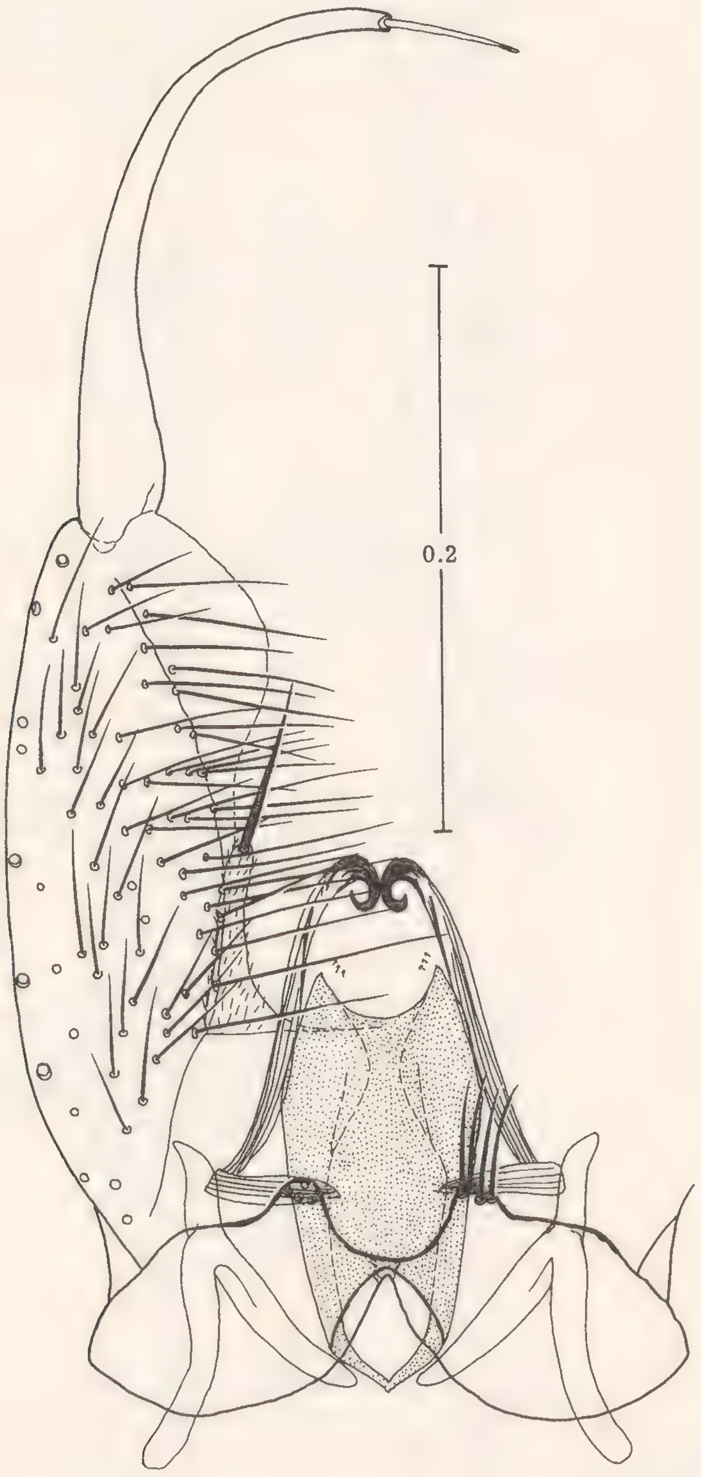
Tizimin
Yucatan
Mexico

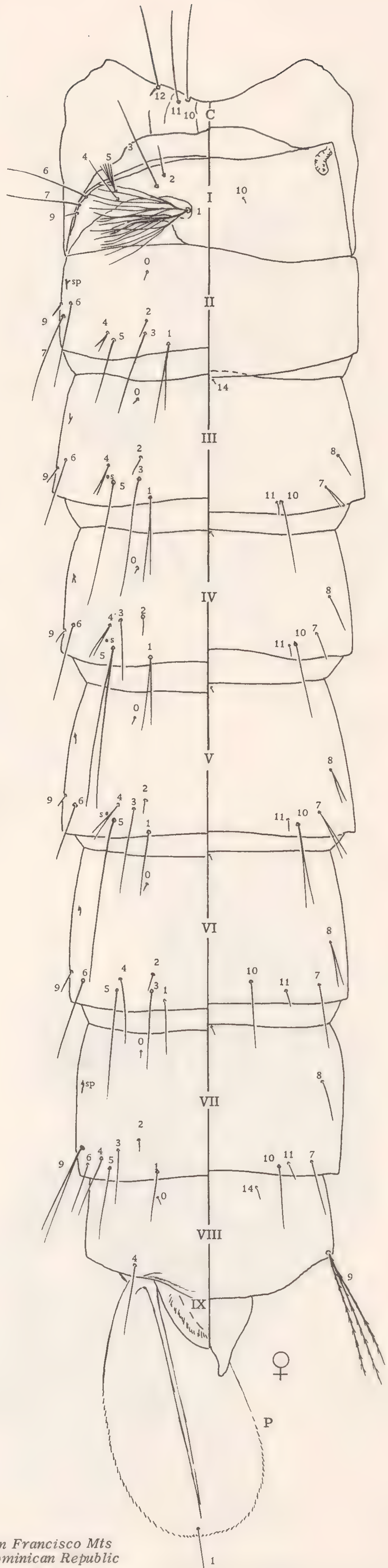
cozumelensis

HOWARDINA

Fig. 31





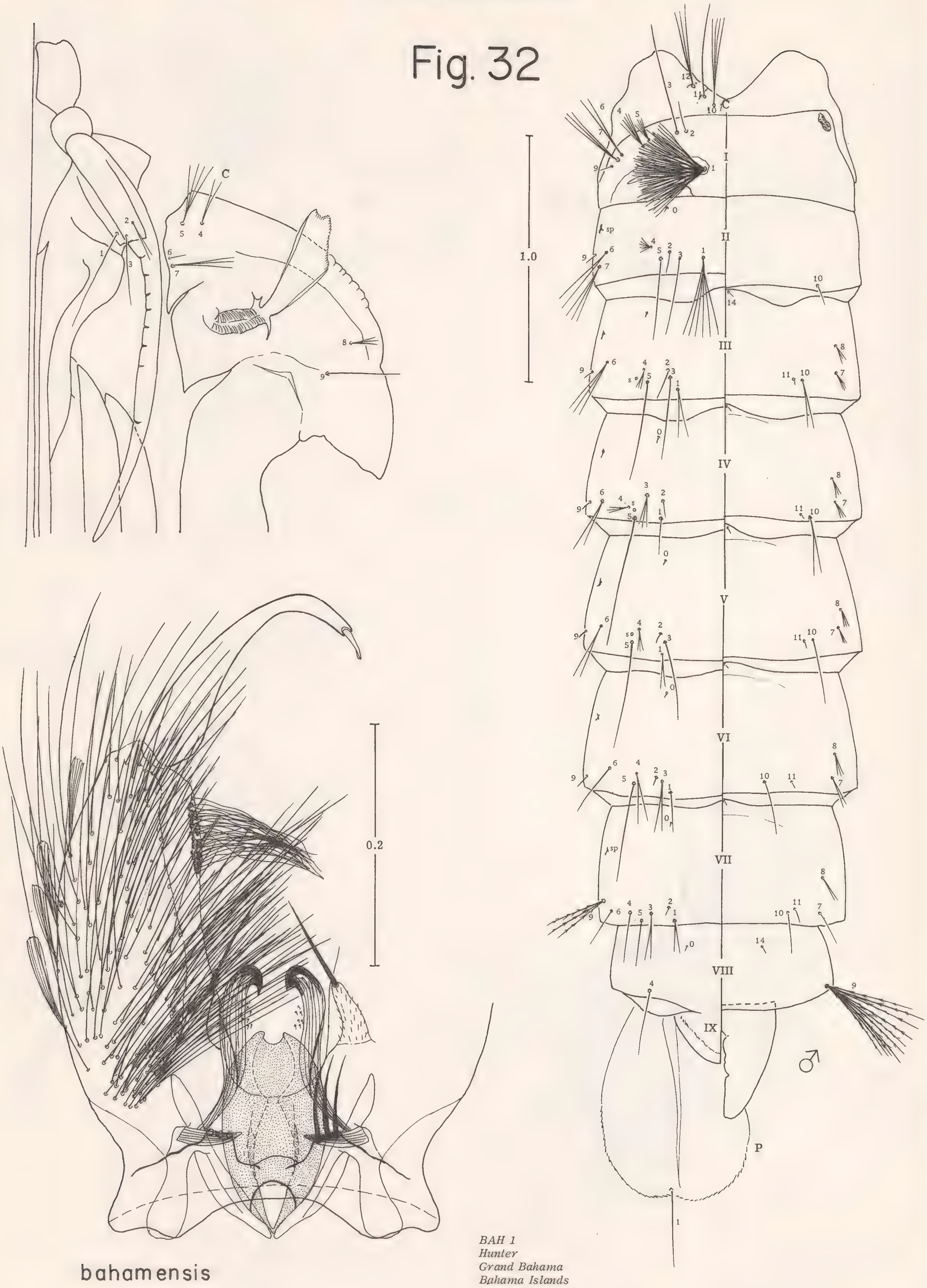


San Francisco Mts
Dominican Republic

albonotatus

HOWARDINA

Fig. 32



bahamensis

BAH 1
Hunter
Grand Bahama
Bahama Islands

HOWARDINA

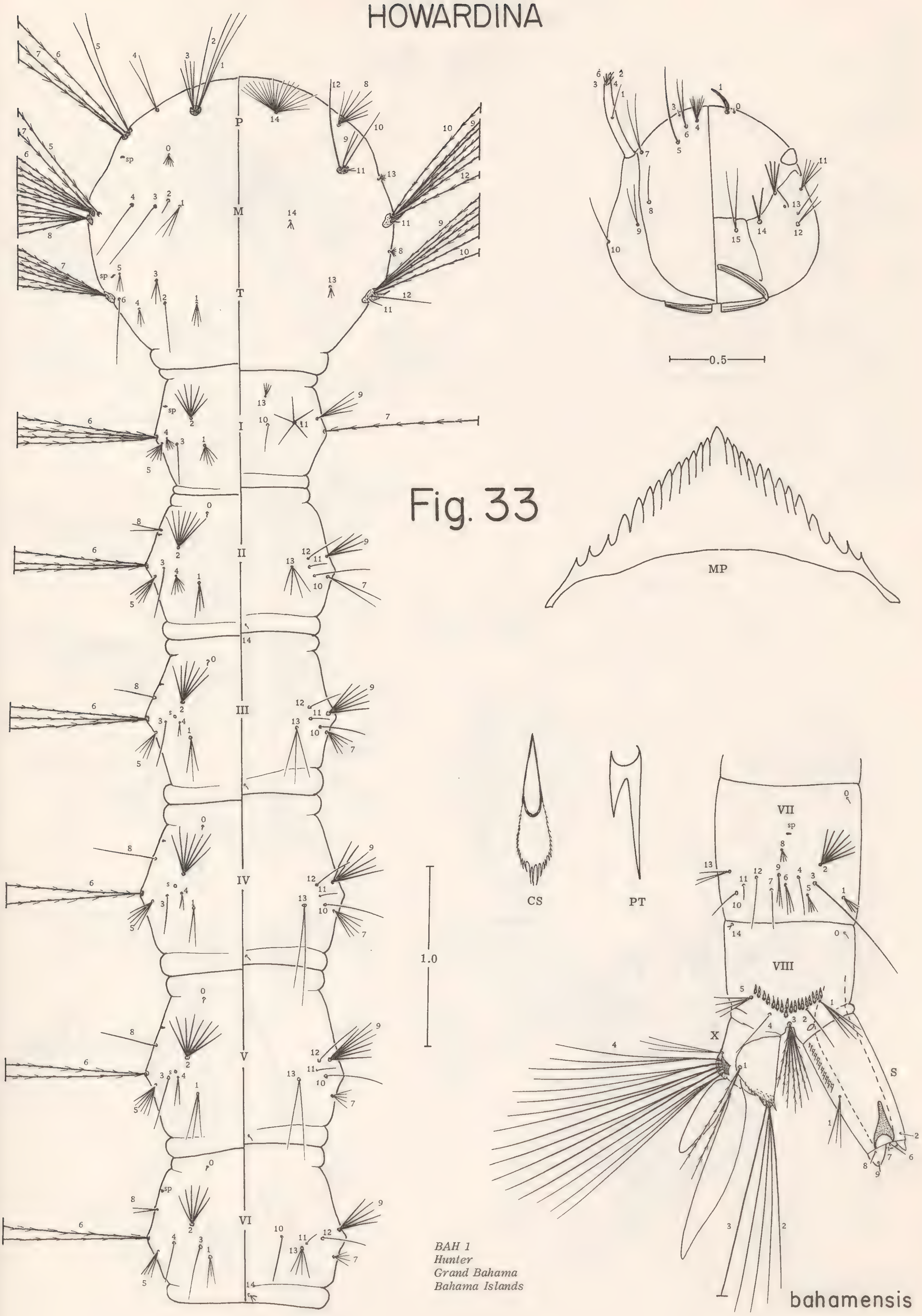


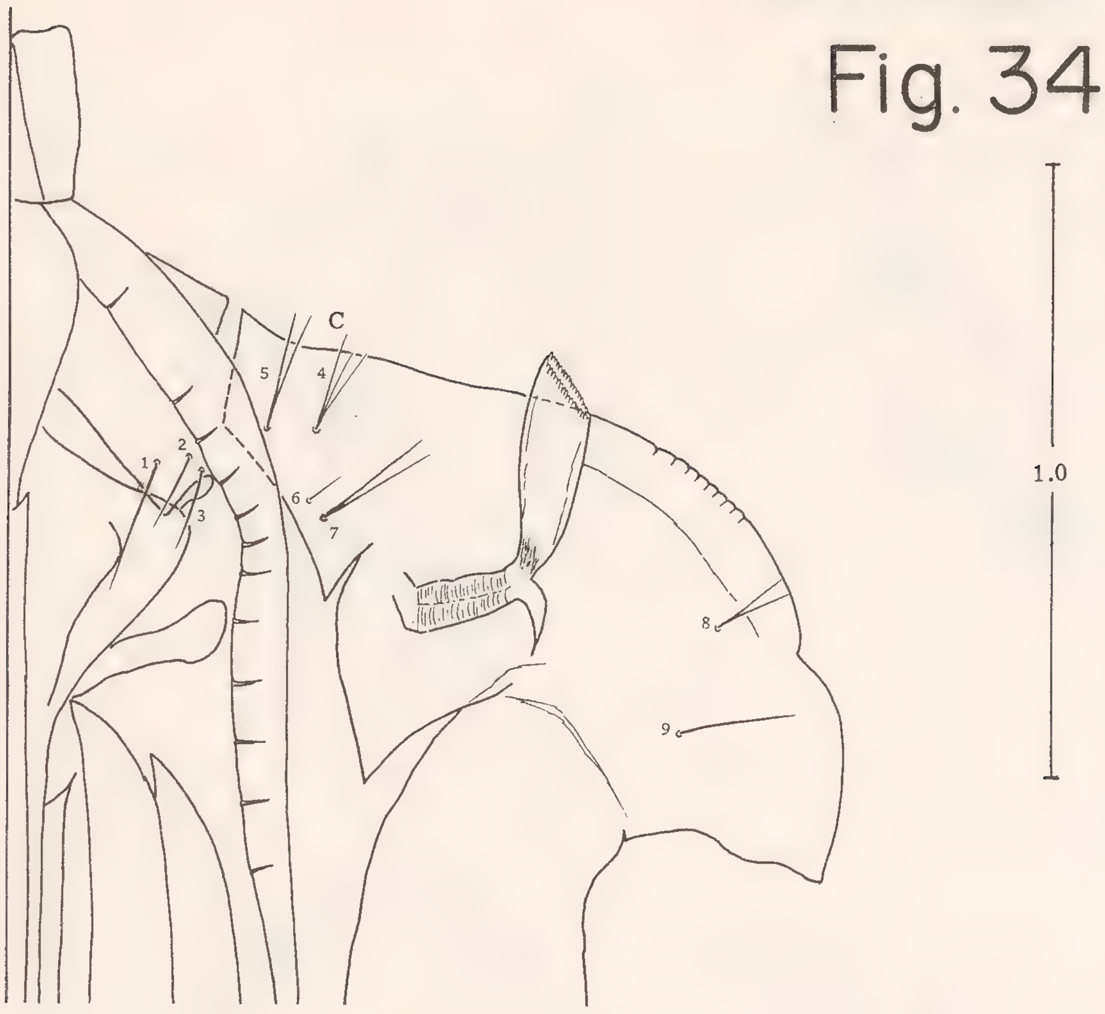
Fig. 33

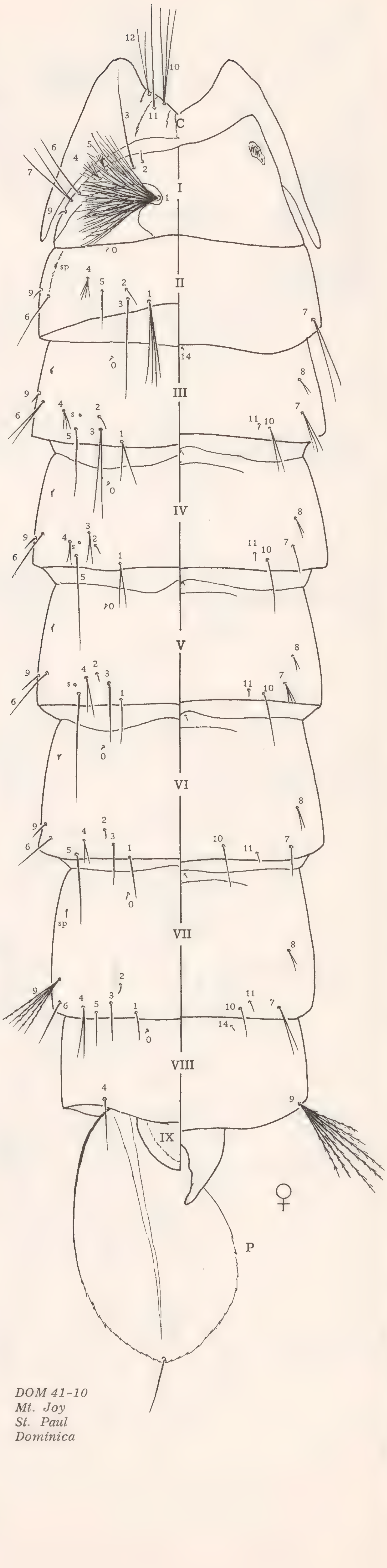
BAH 1
Hunter
Grand Bahama
Bahama Islands

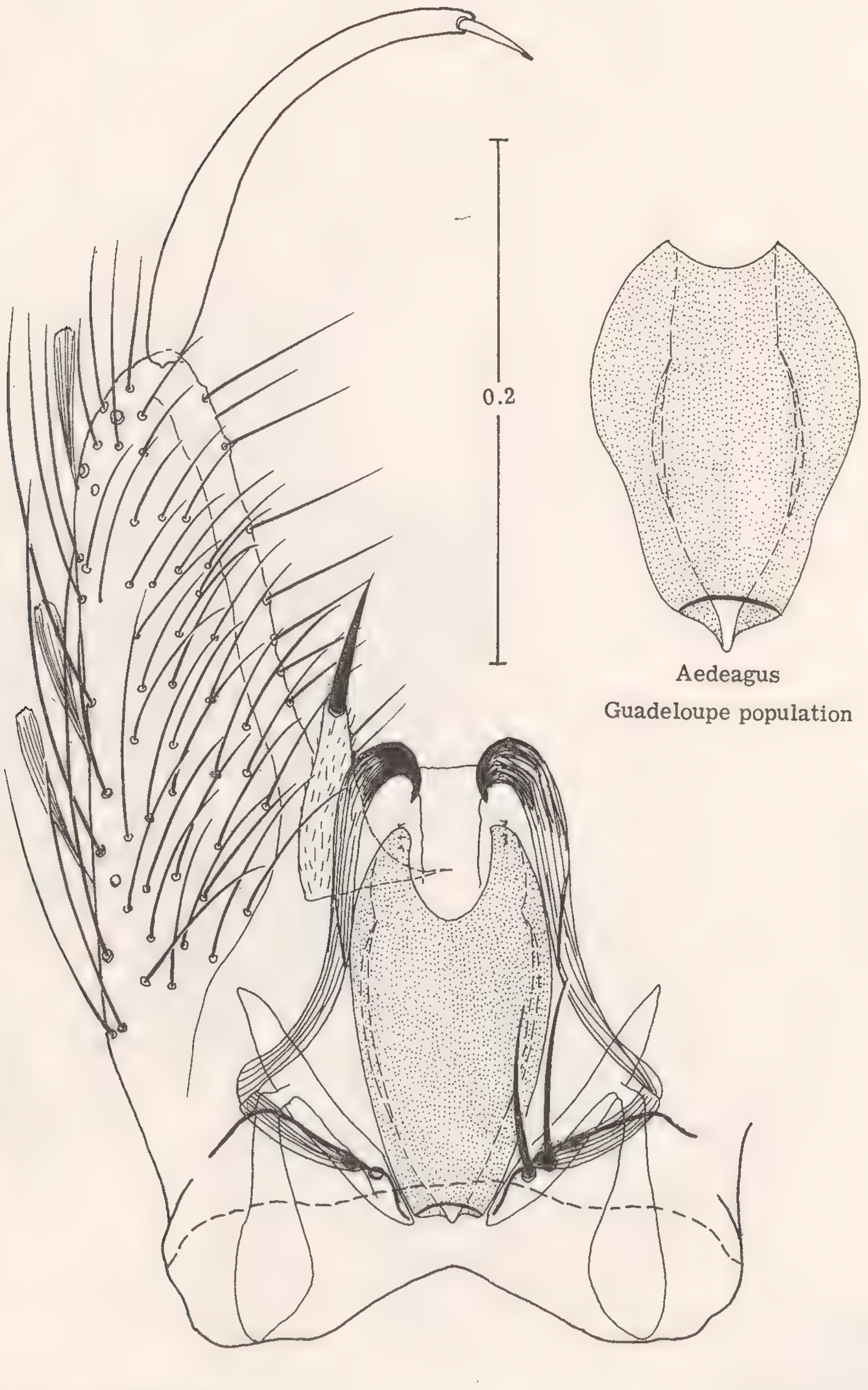
bahamensis

HOWARDINA

Fig. 34







busckii

DOM 41-10
Mt. Joy
St. Paul
Dominica

HOWARDINA

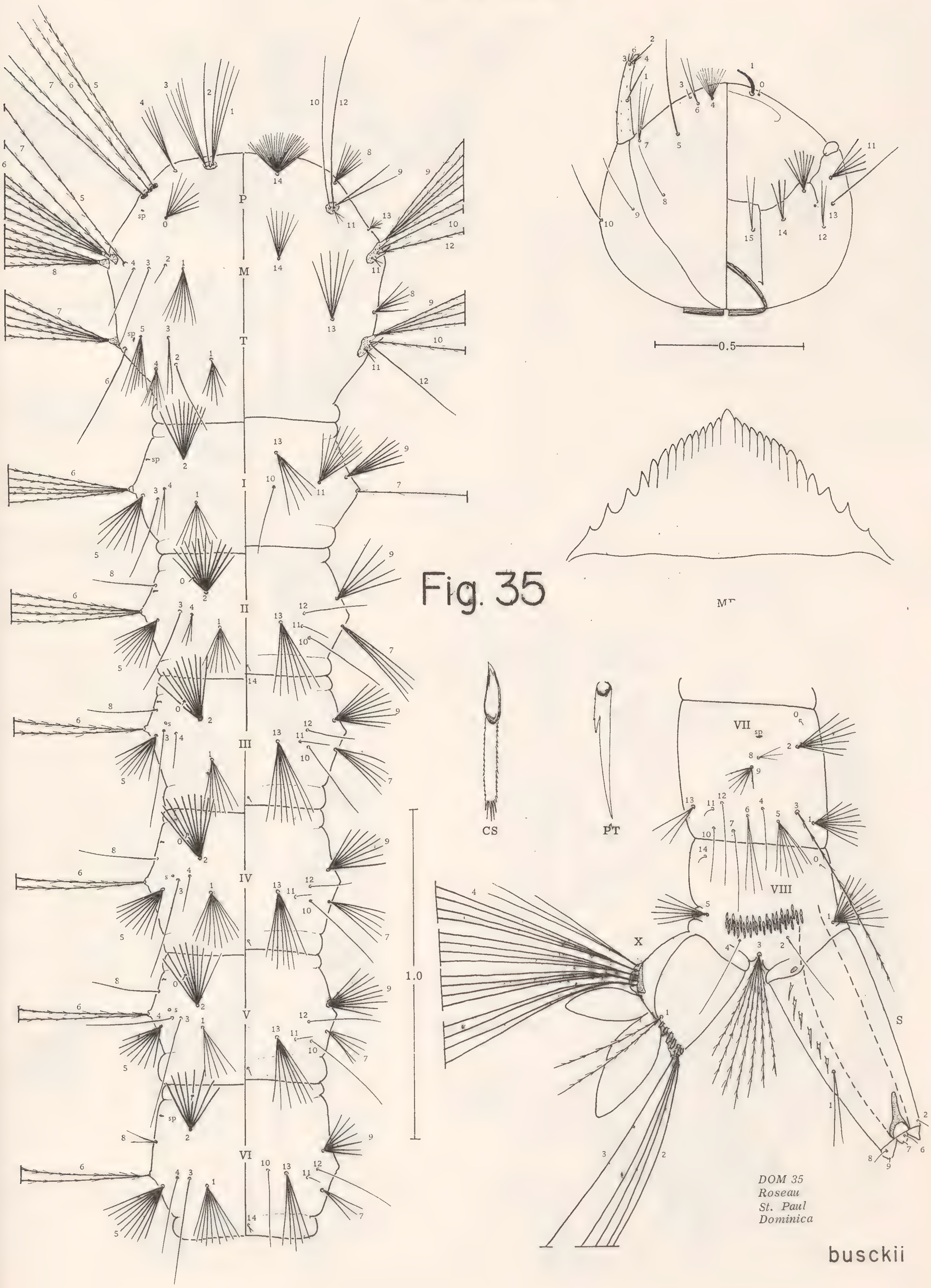


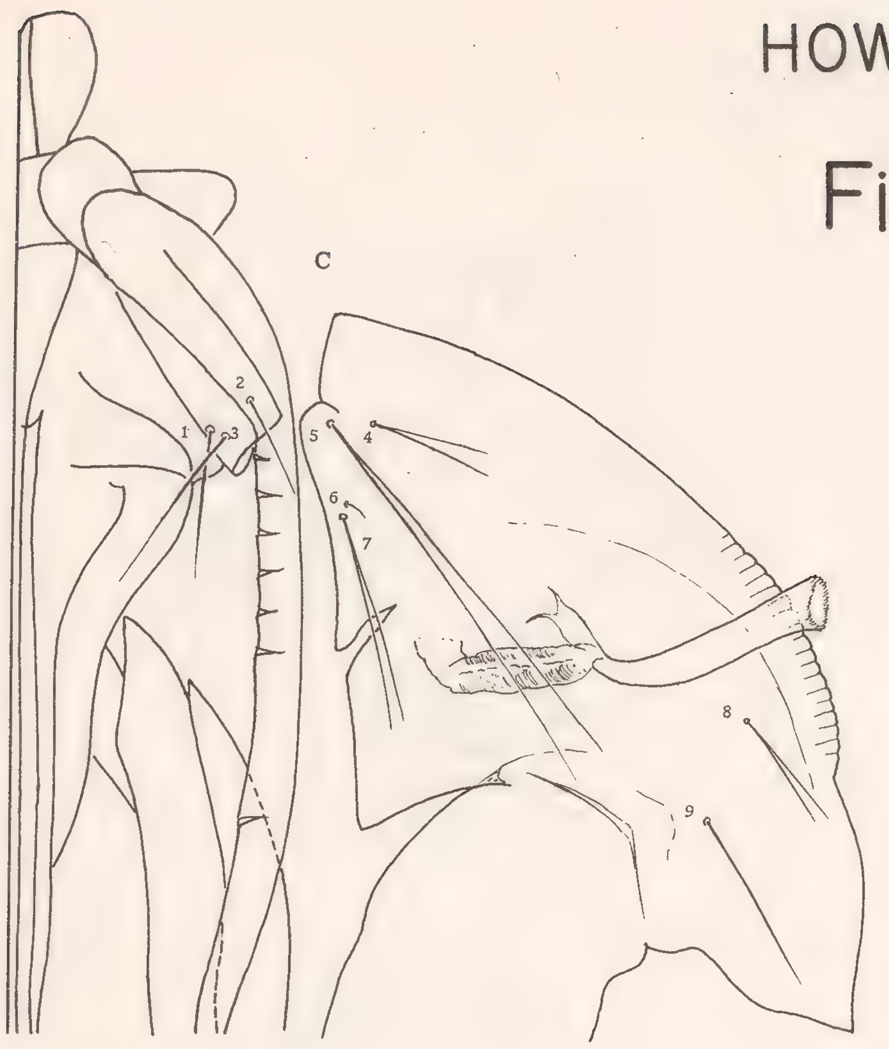
Fig. 35

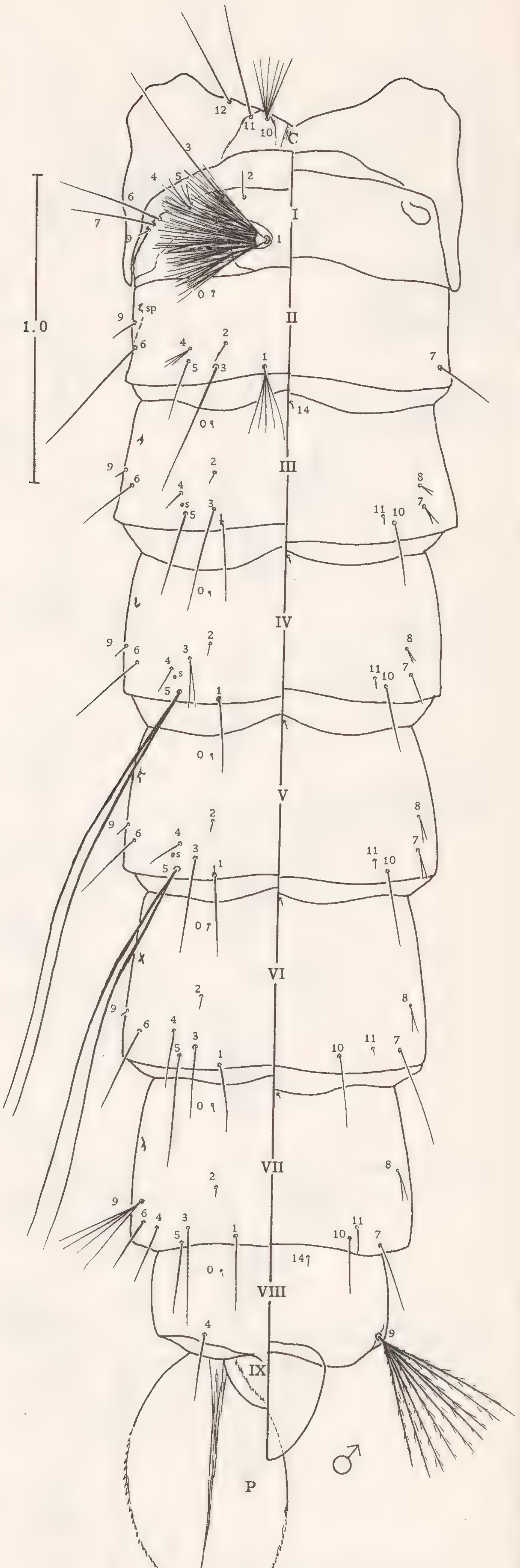
DOM 35
Roseau
St. Paul
Dominica

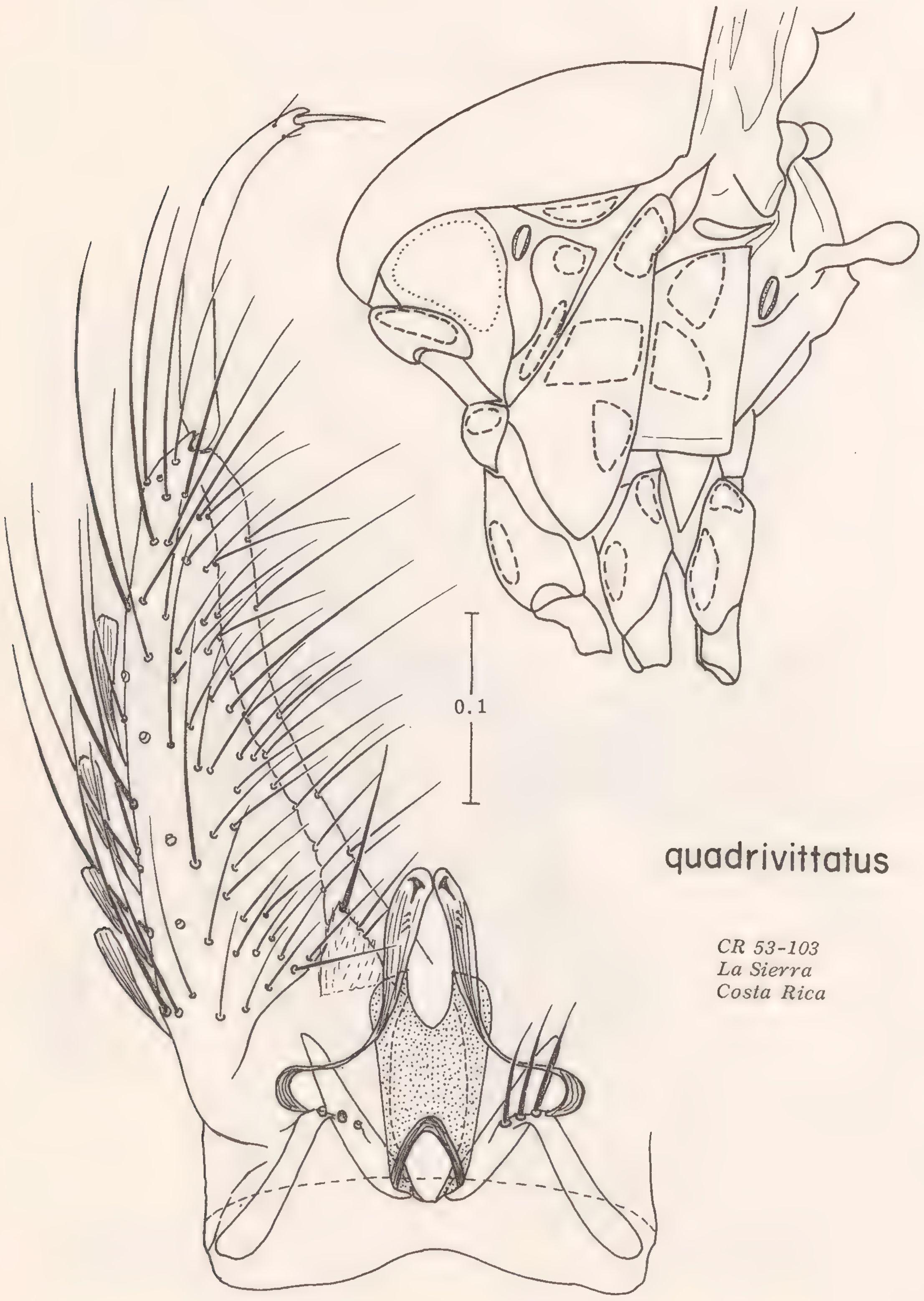
busckii

HOWARDINA

Fig. 36





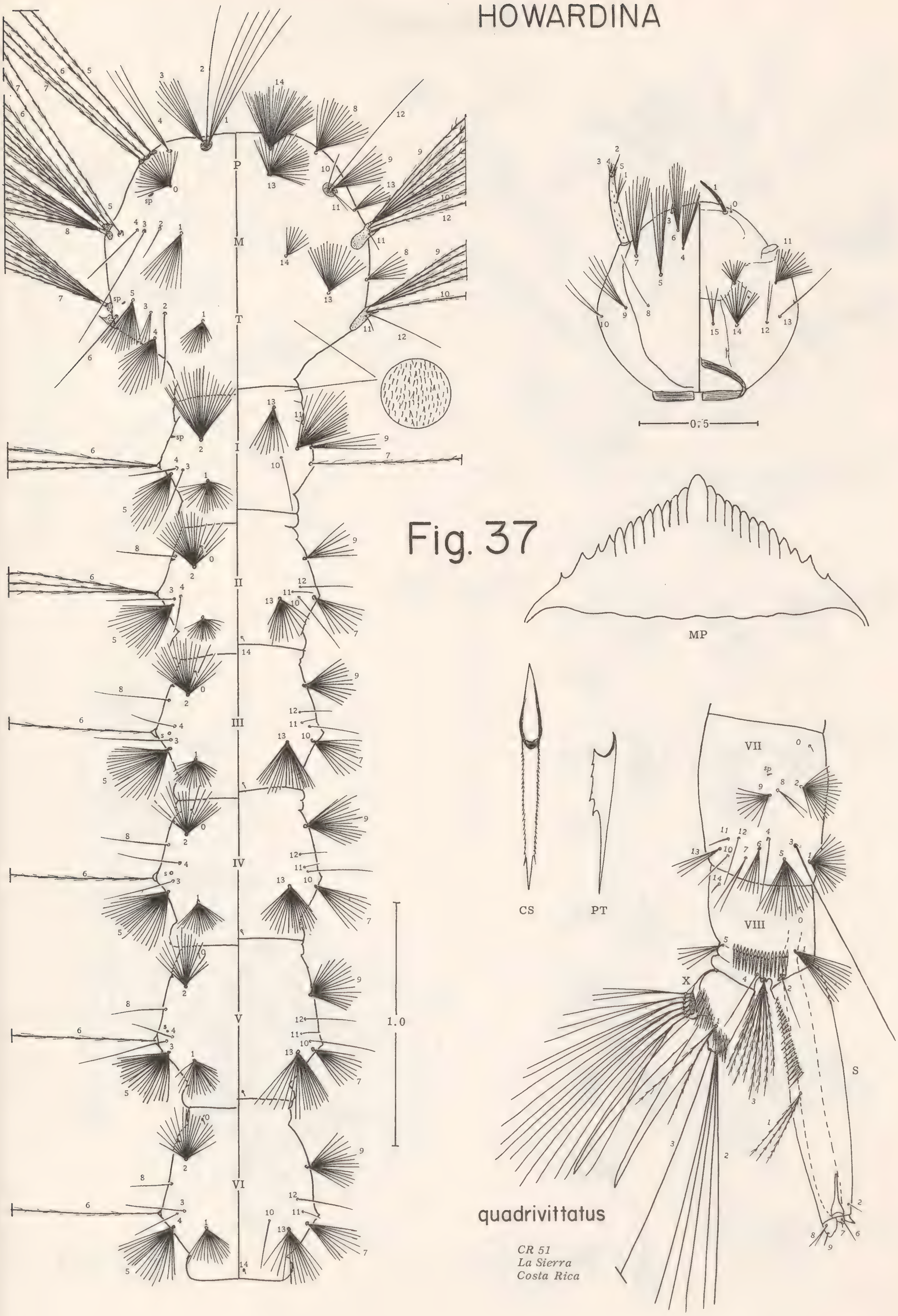


quadrivittatus

CR 53-103
La Sierra
Costa Rica

HOWARDINA

Fig. 37



quadrivittatus

CR 51
La Sierra
Costa Rica

HOWARDINA

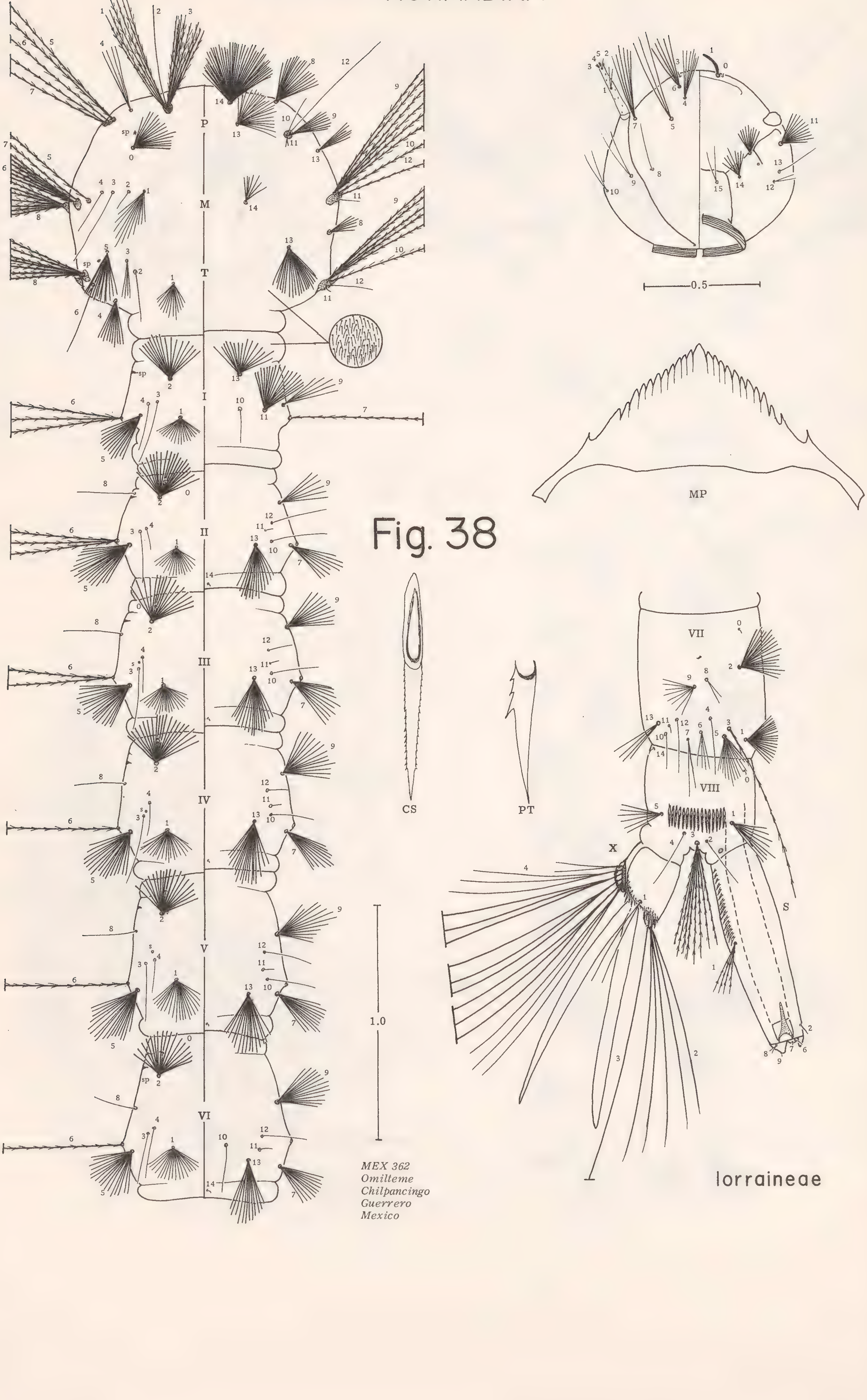


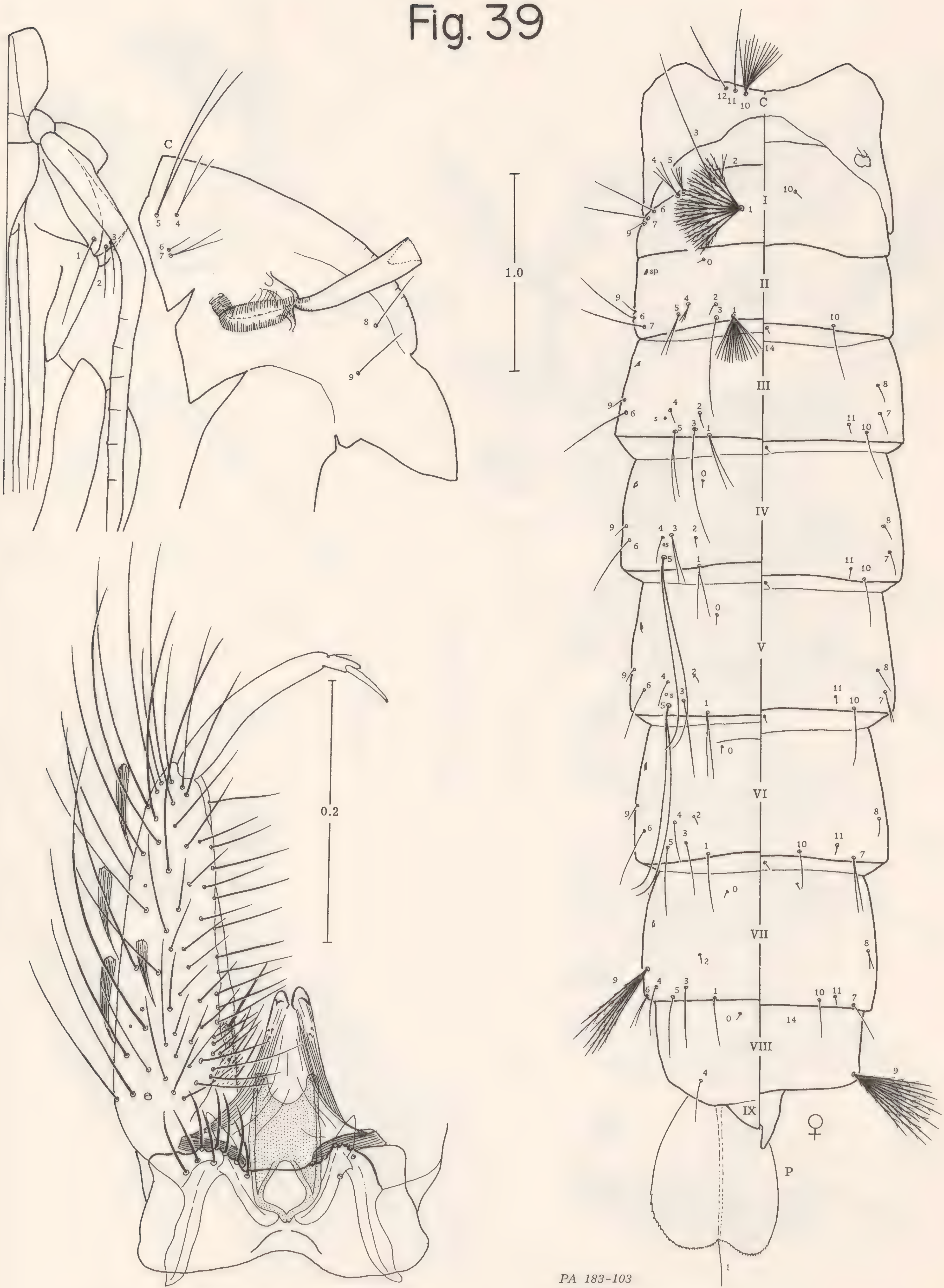
Fig. 38

lorraineae

MEX 362
Omilteme
Chilpancingo
Guerrero
Mexico

HOWARDINA

Fig. 39



brevis

PA 183-103
La Zorra
Chiriquisito
Bocas del Toro
Panama

HOWARDINA

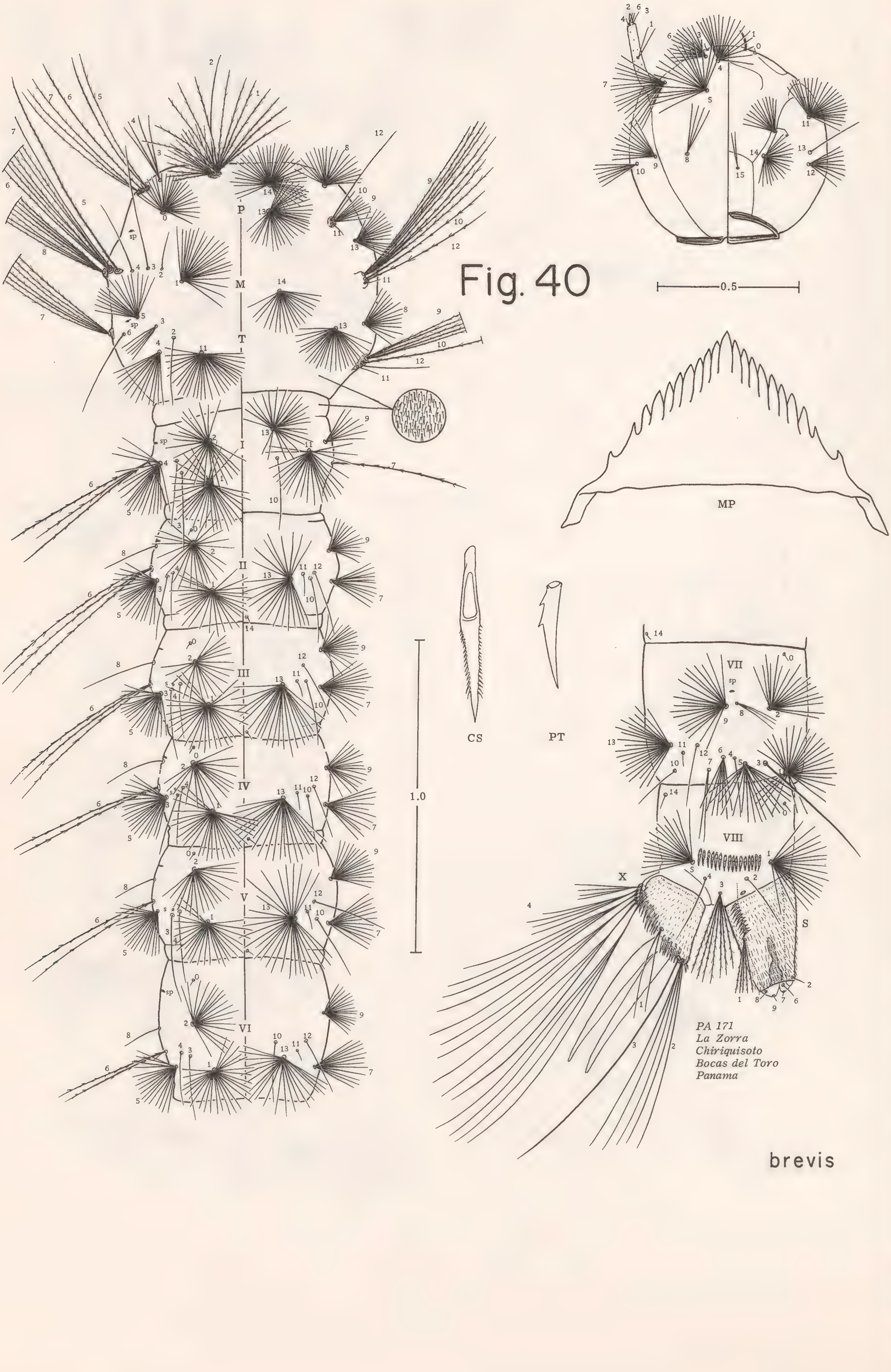


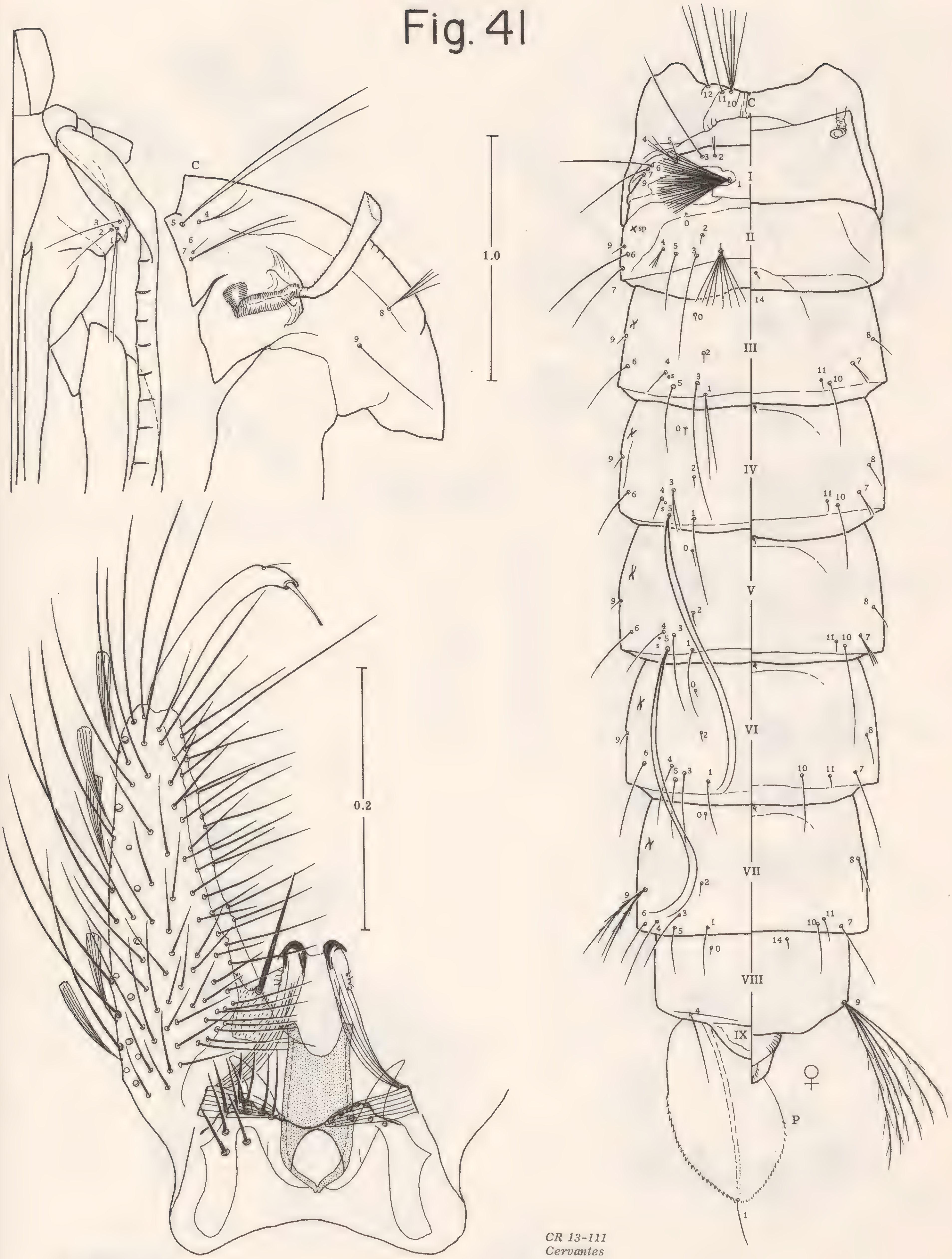
Fig. 40

PA 171
La Zorra
Chiriquisoto
Bocas del Toro
Panama

brevis

HOWARDINA

Fig. 41



spinosus

CR 13-111
Cervantes
Cartago
Costa Rica

HOWARDINA

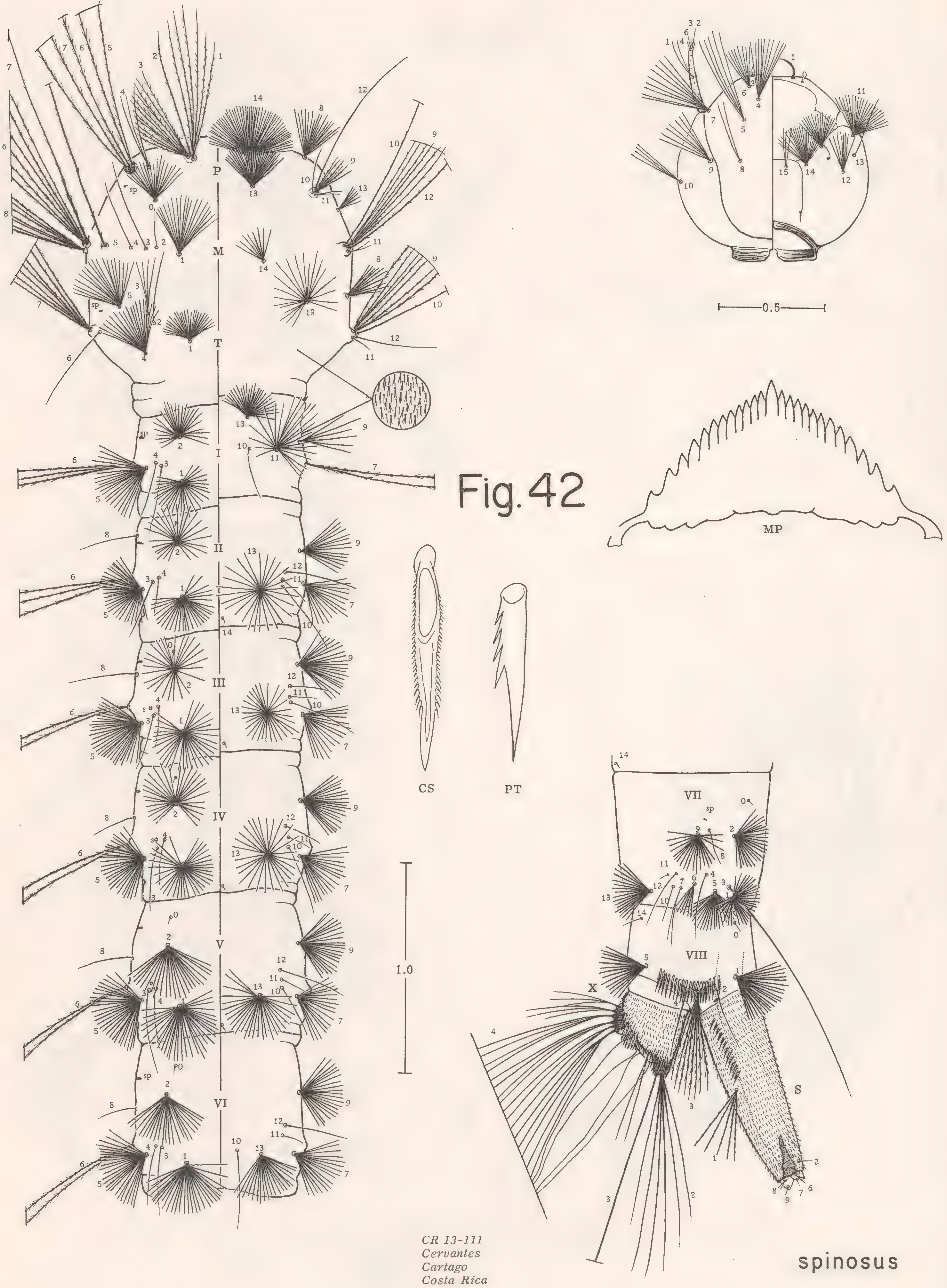


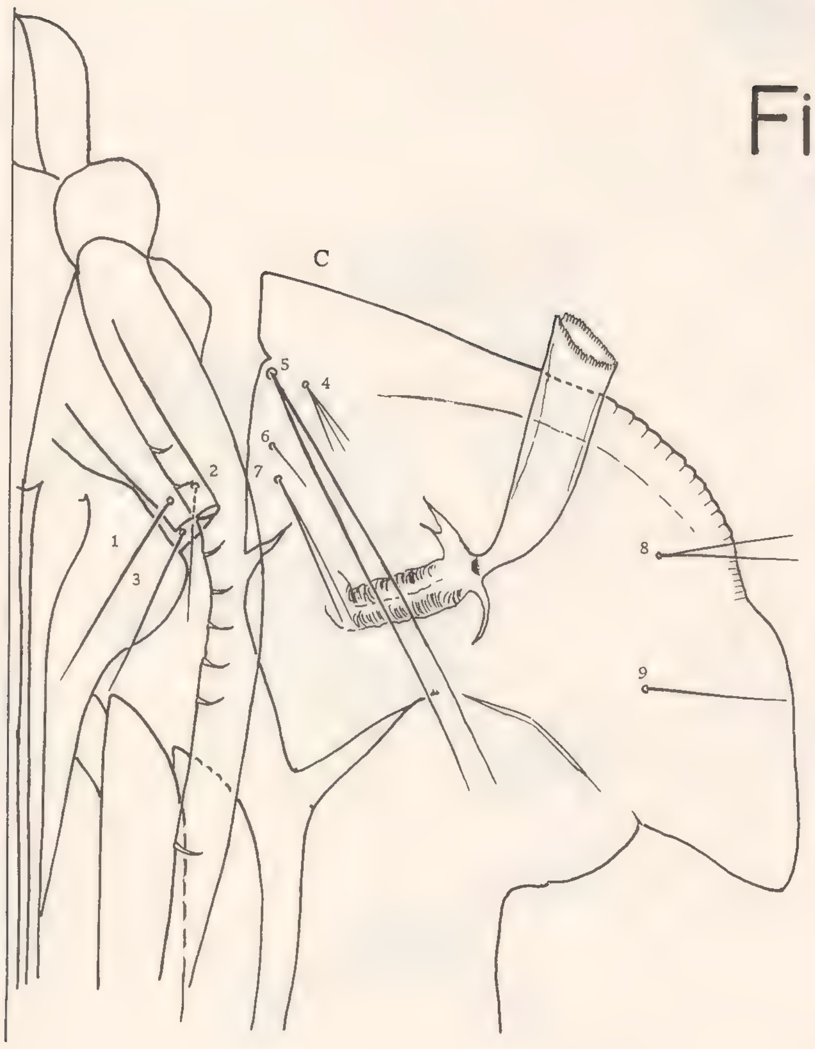
Fig. 42

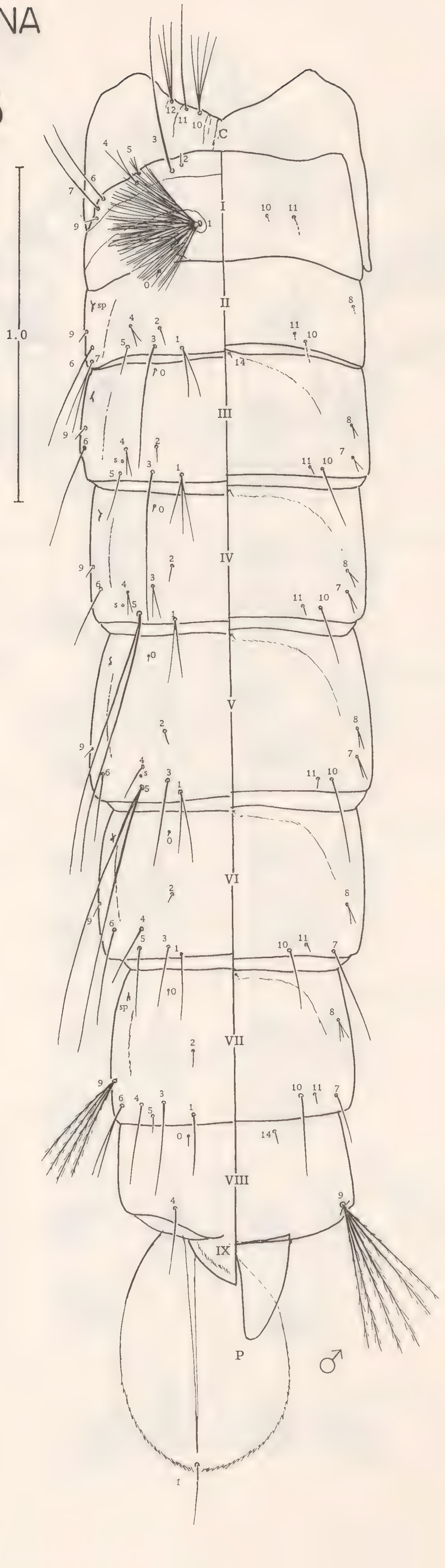
CR 13-111
Cervantes
Cartago
Costa Rica

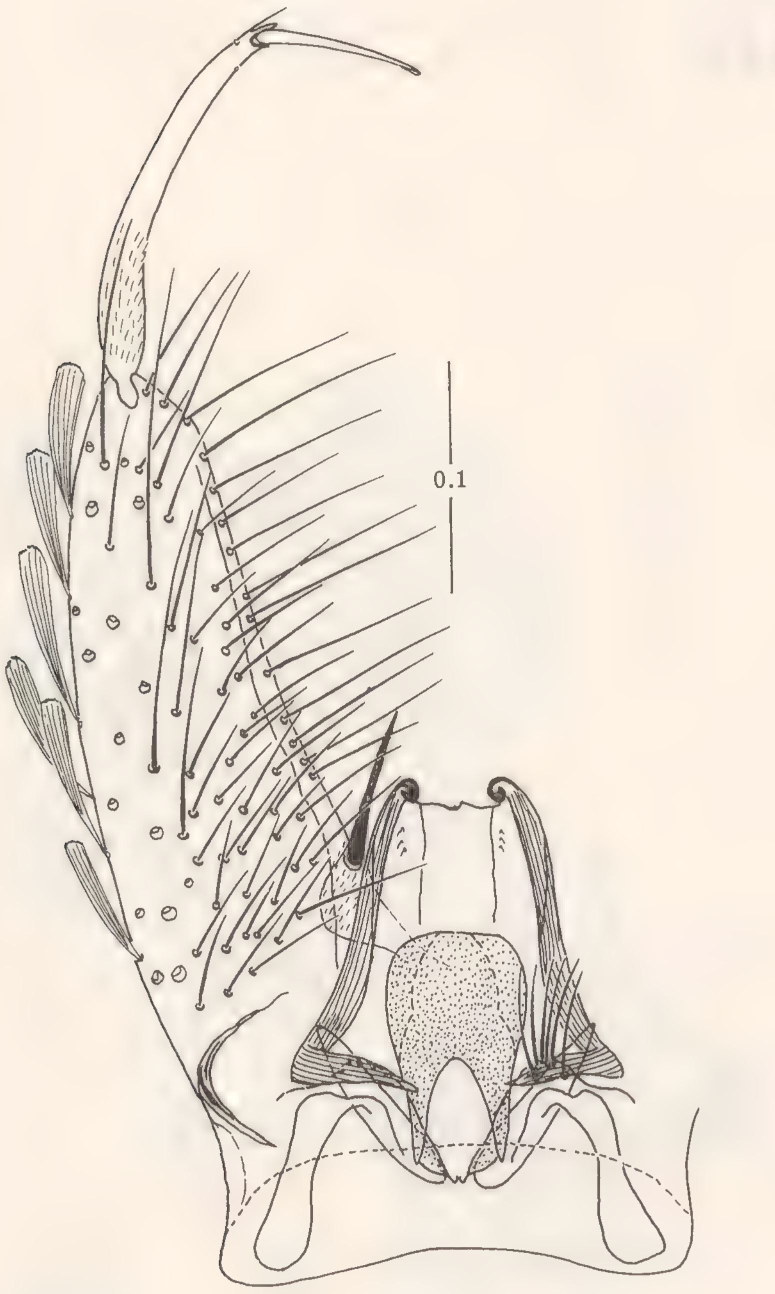
spinosus

HOWARDINA

Fig. 43







sexlineatus

TR 1041
La Laja Trace
Arima
St. George
Trinidad

HOWARDINA

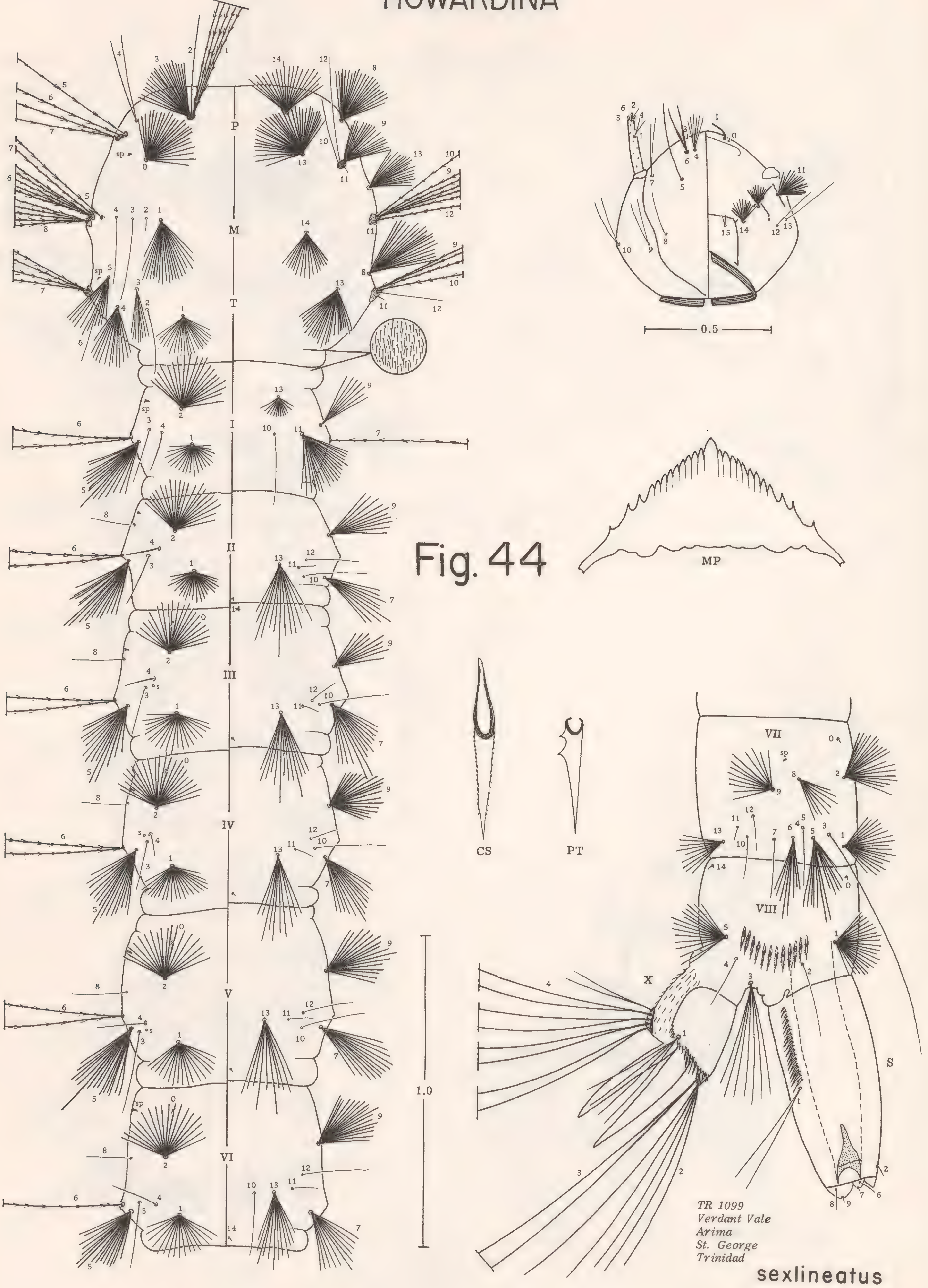


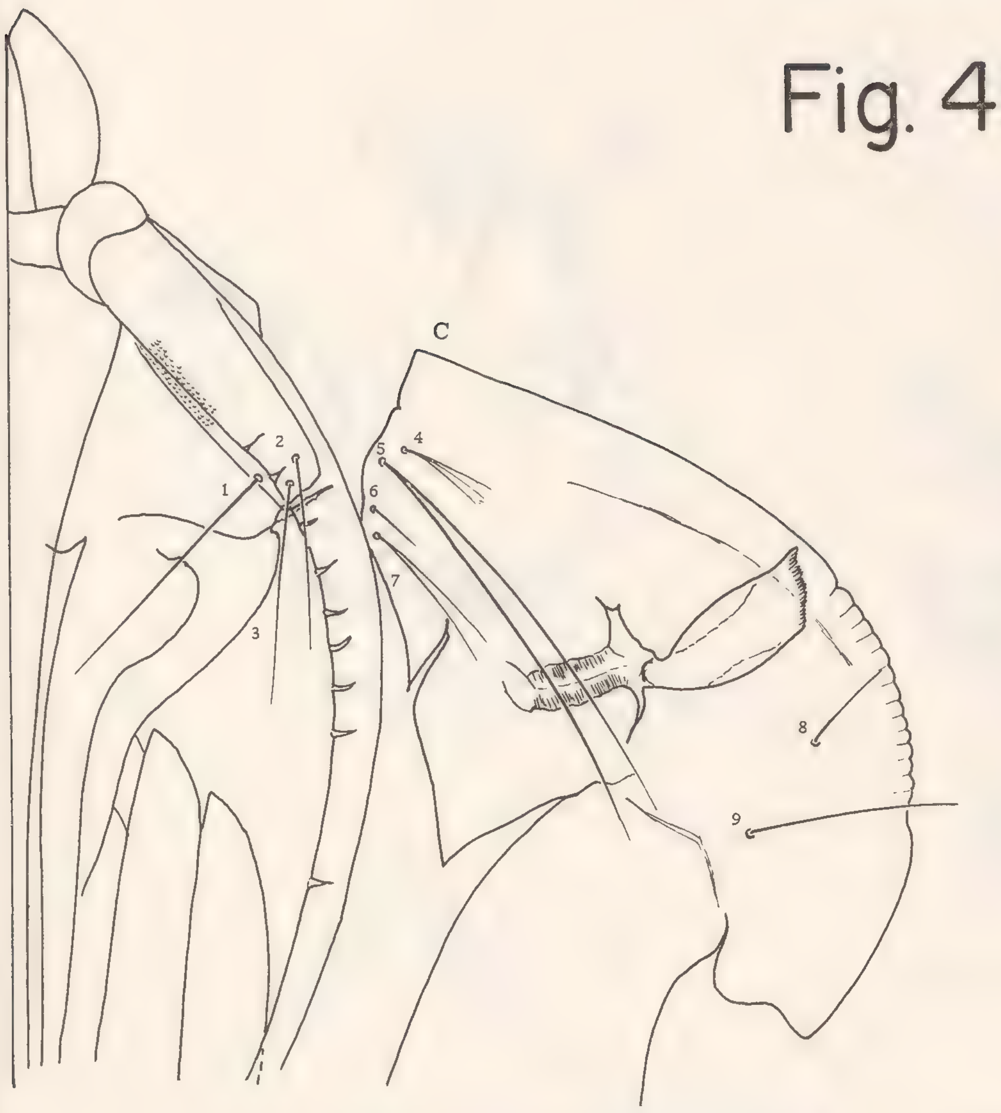
Fig. 44

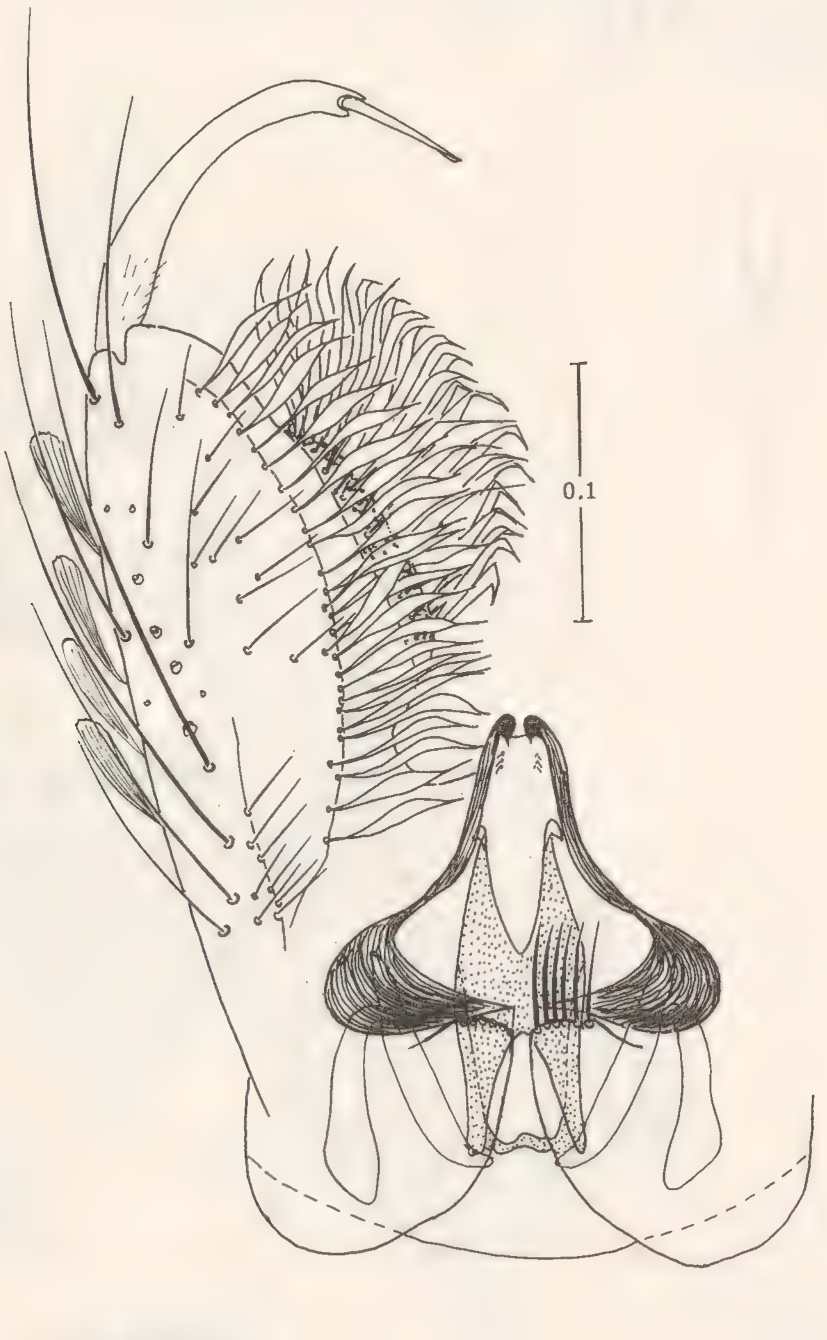
TR 1099
Verdant Vale
Arima
St. George
Trinidad

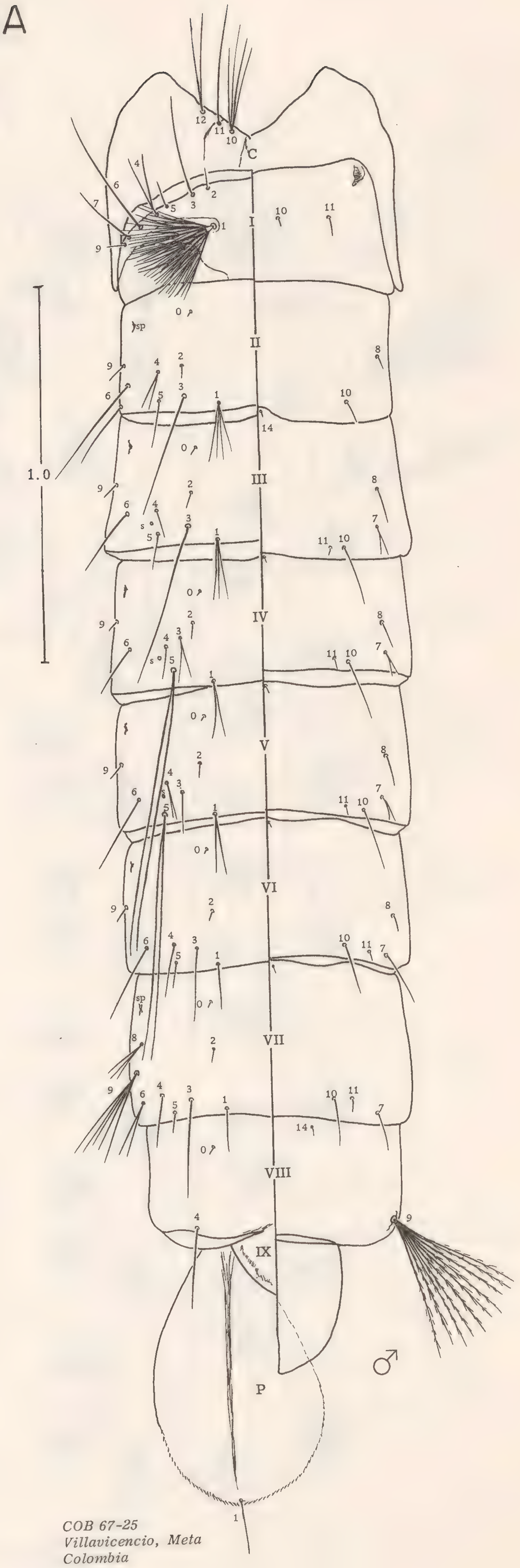
sexlineatus

HOWARDINA

Fig. 45







whitmorei

COB 67-25
Villavicencio, Meta
Colombia

HOWARDINA

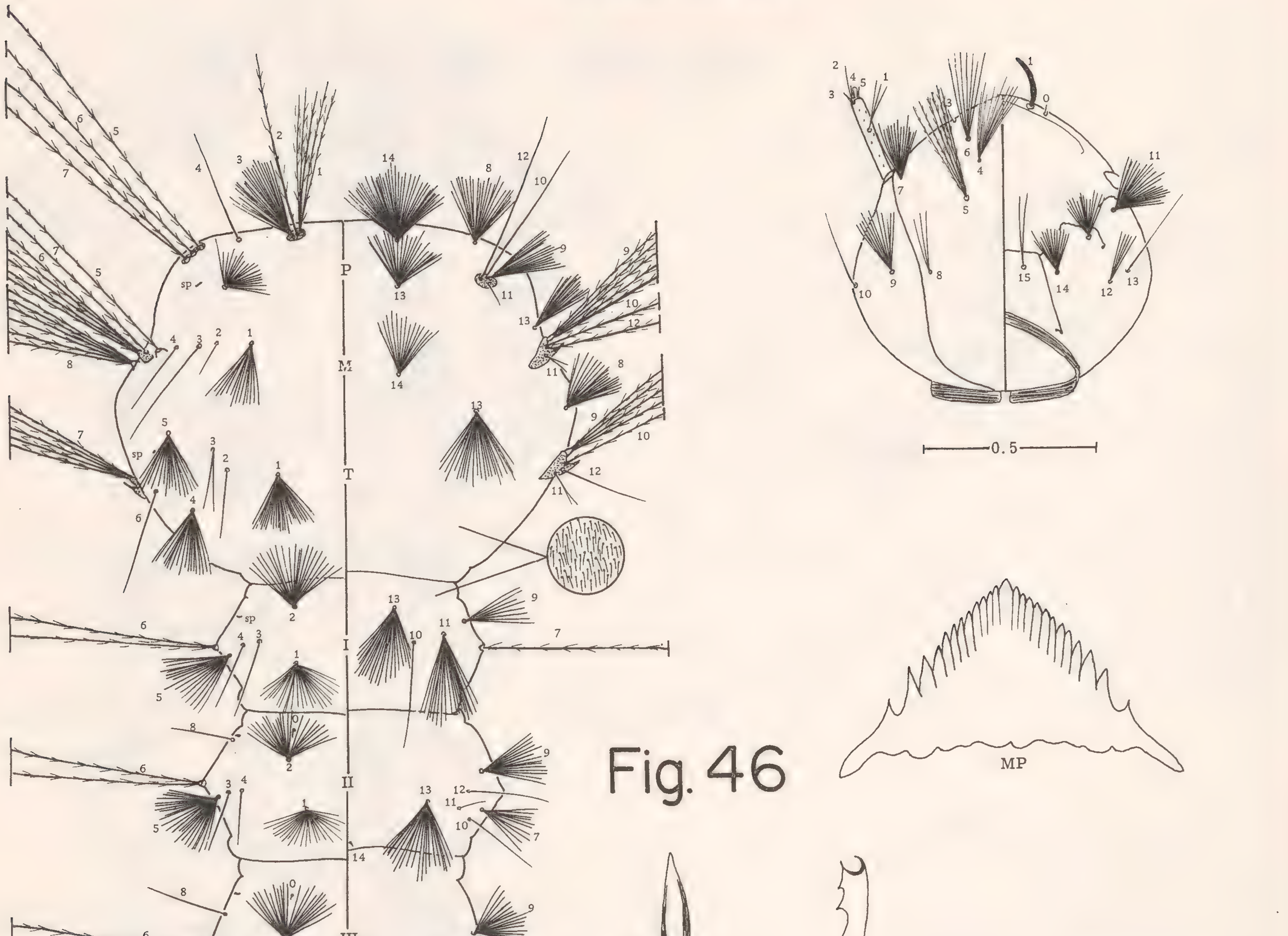


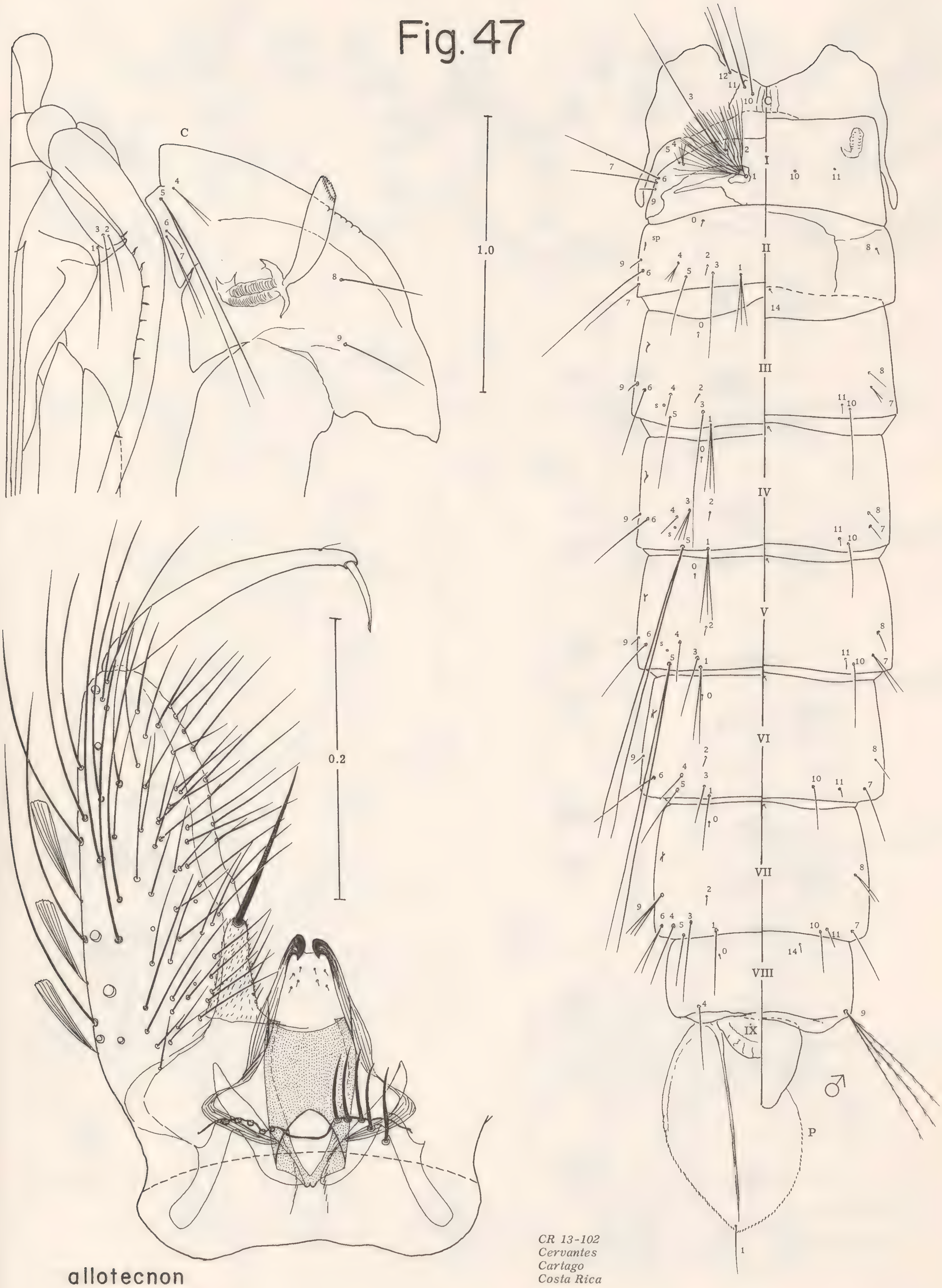
Fig. 46

COB 68
Buena Vista
Villavicencio, Meta
Colombia

whitmorei

HOWARDINA

Fig. 47



allotecnon

CR 13-102
Cervantes
Cartago
Costa Rica

HOWARDINA

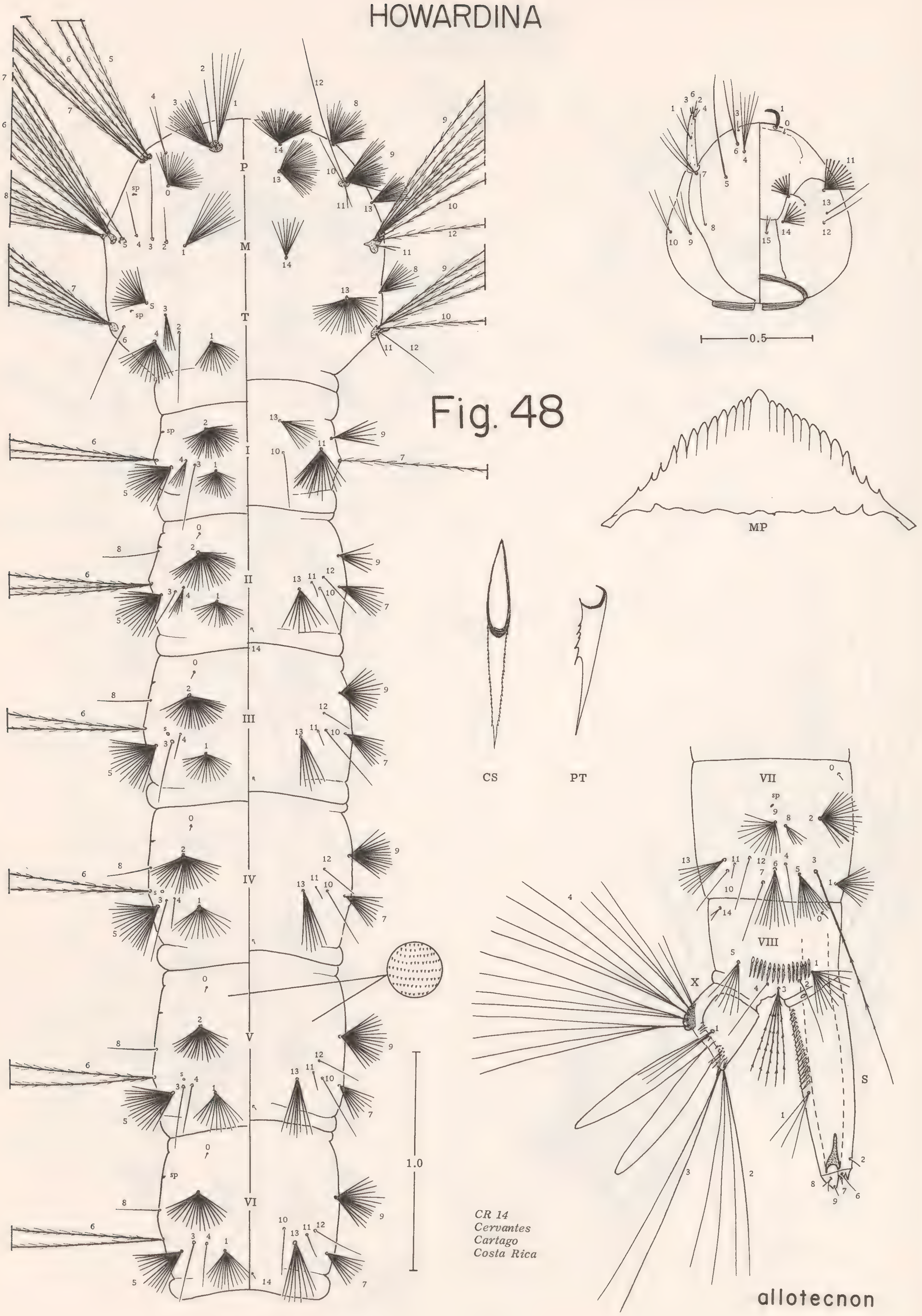


Fig. 48

CR 14
Cervantes
Cartago
Costa Rica

allotecnon

HOWARDINA

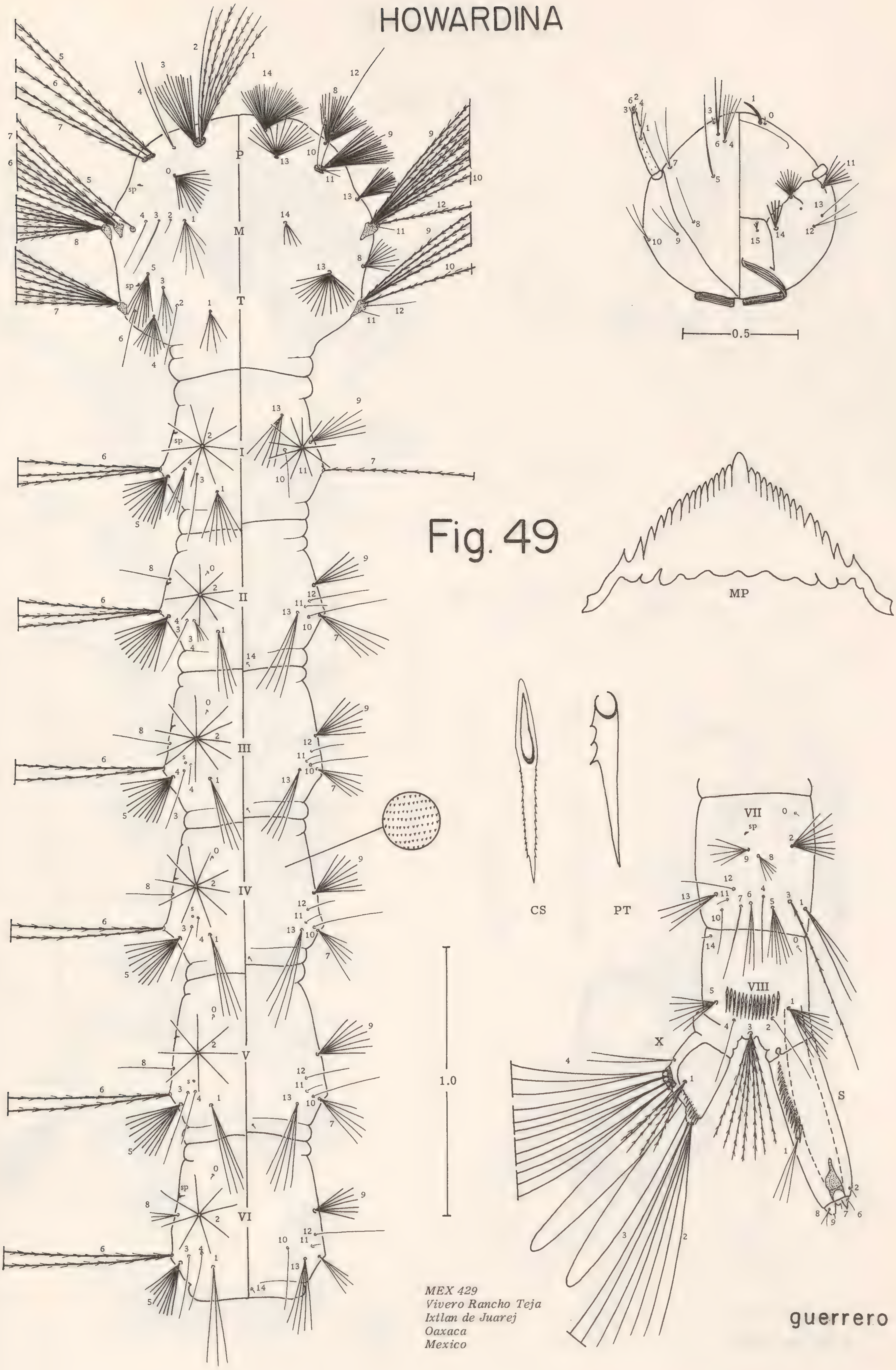


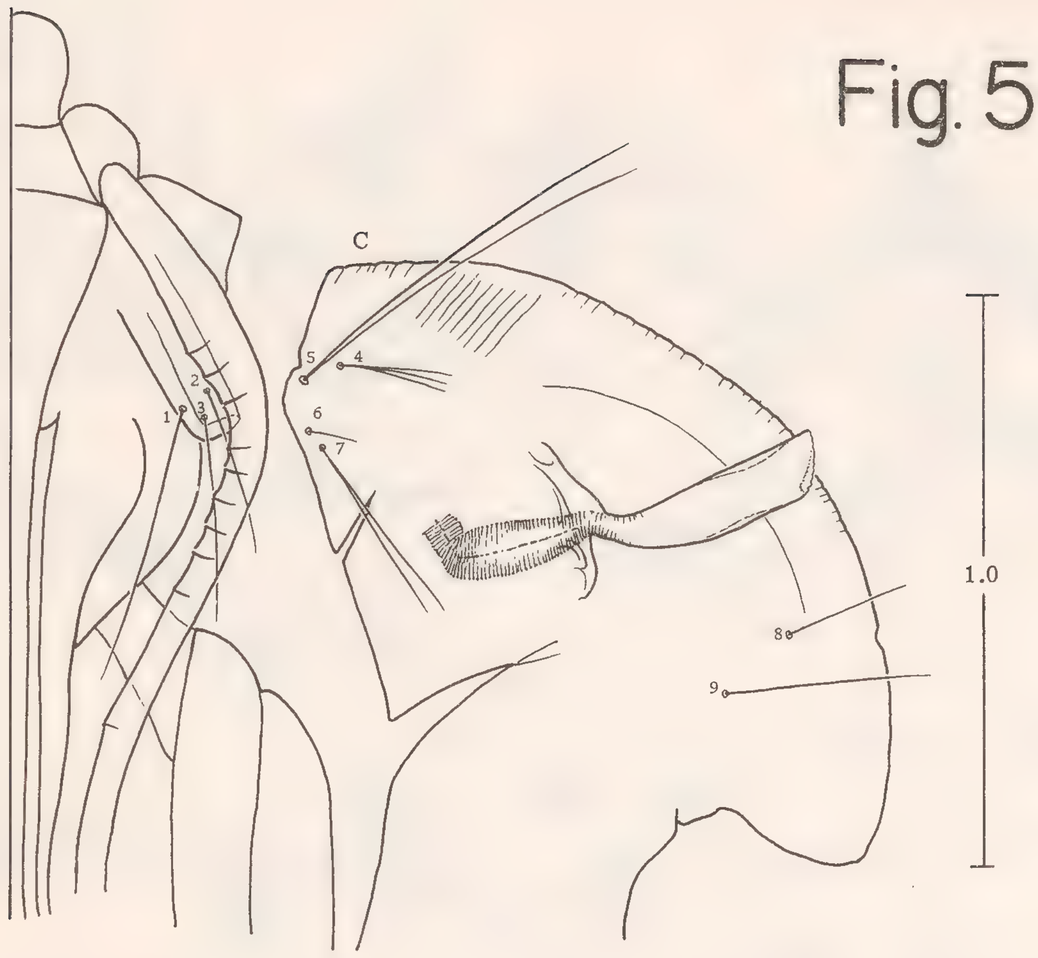
Fig. 49

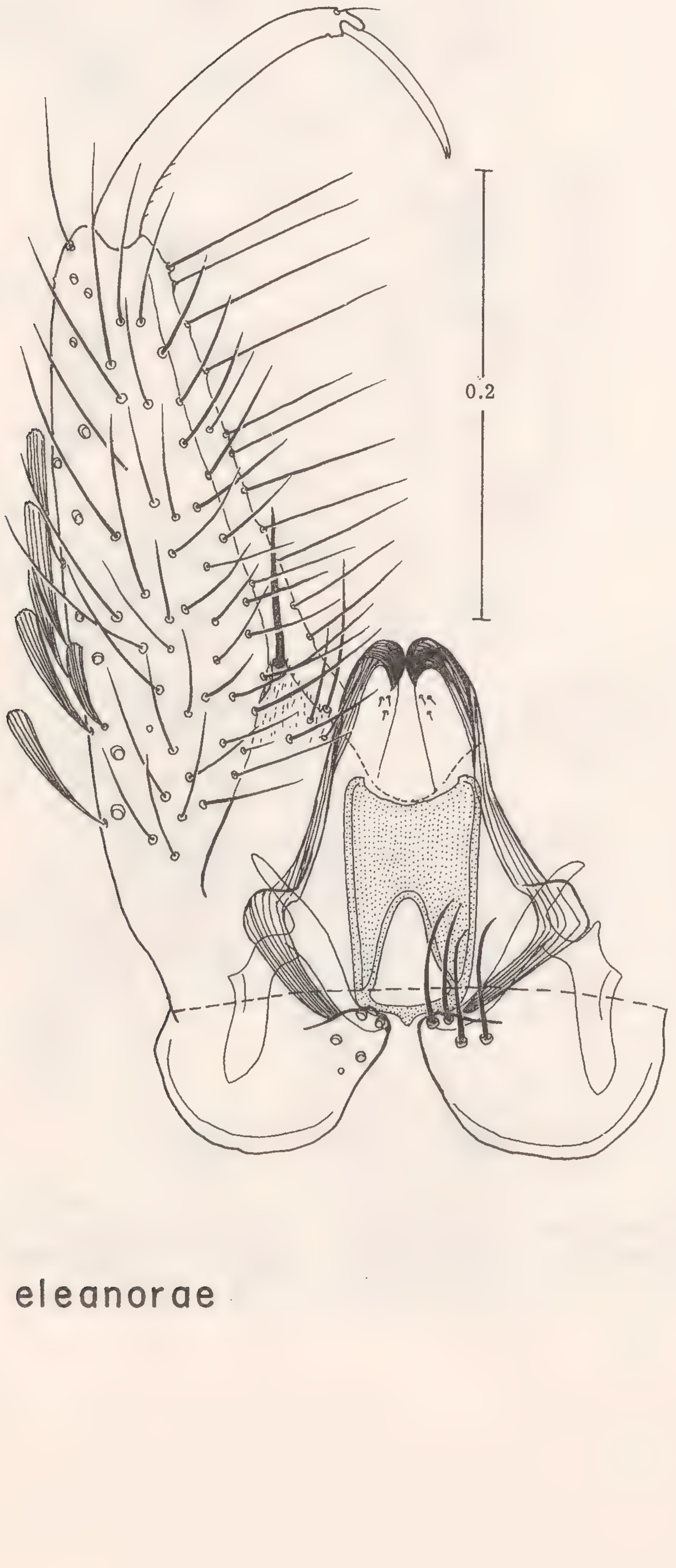
MEX 429
Vivero Rancho Teja
Ixtlan de Juarej
Oaxaca
Mexico

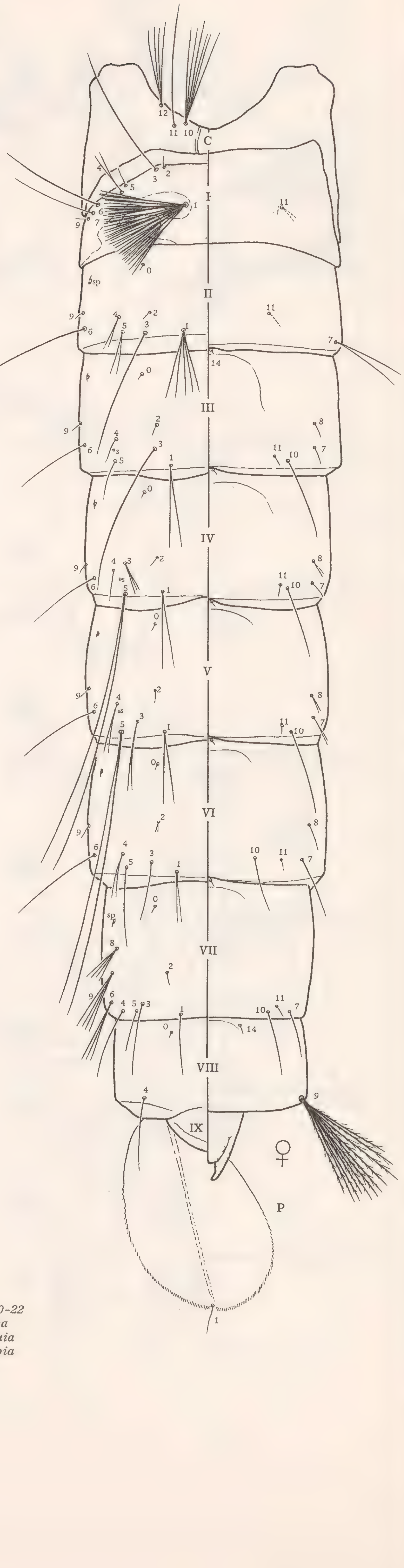
guerrero

HOWARDINA

Fig. 50







eleanorae

COB 10-22
Buritica
Antioquia
Colombia

HOWARDINA

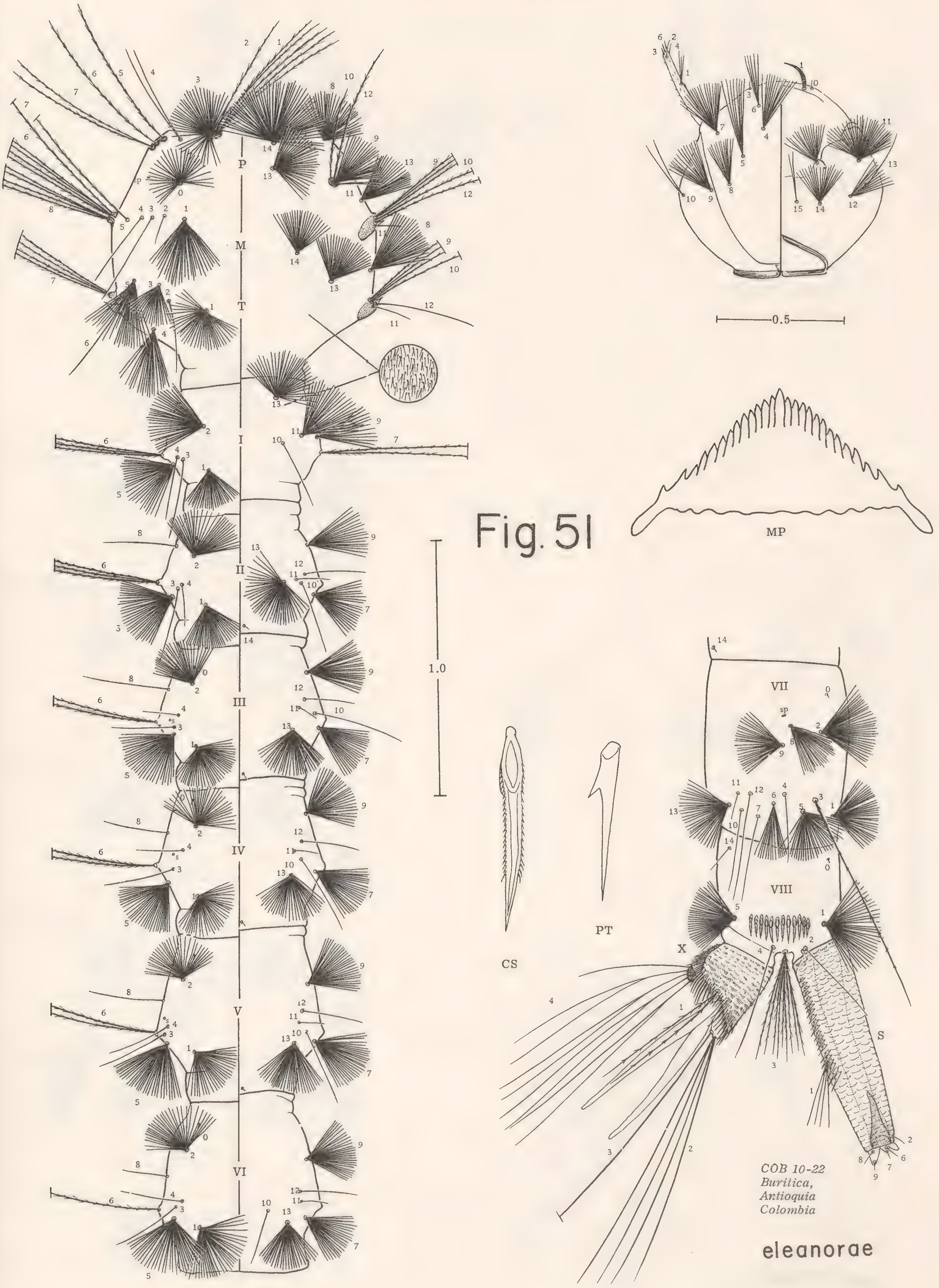
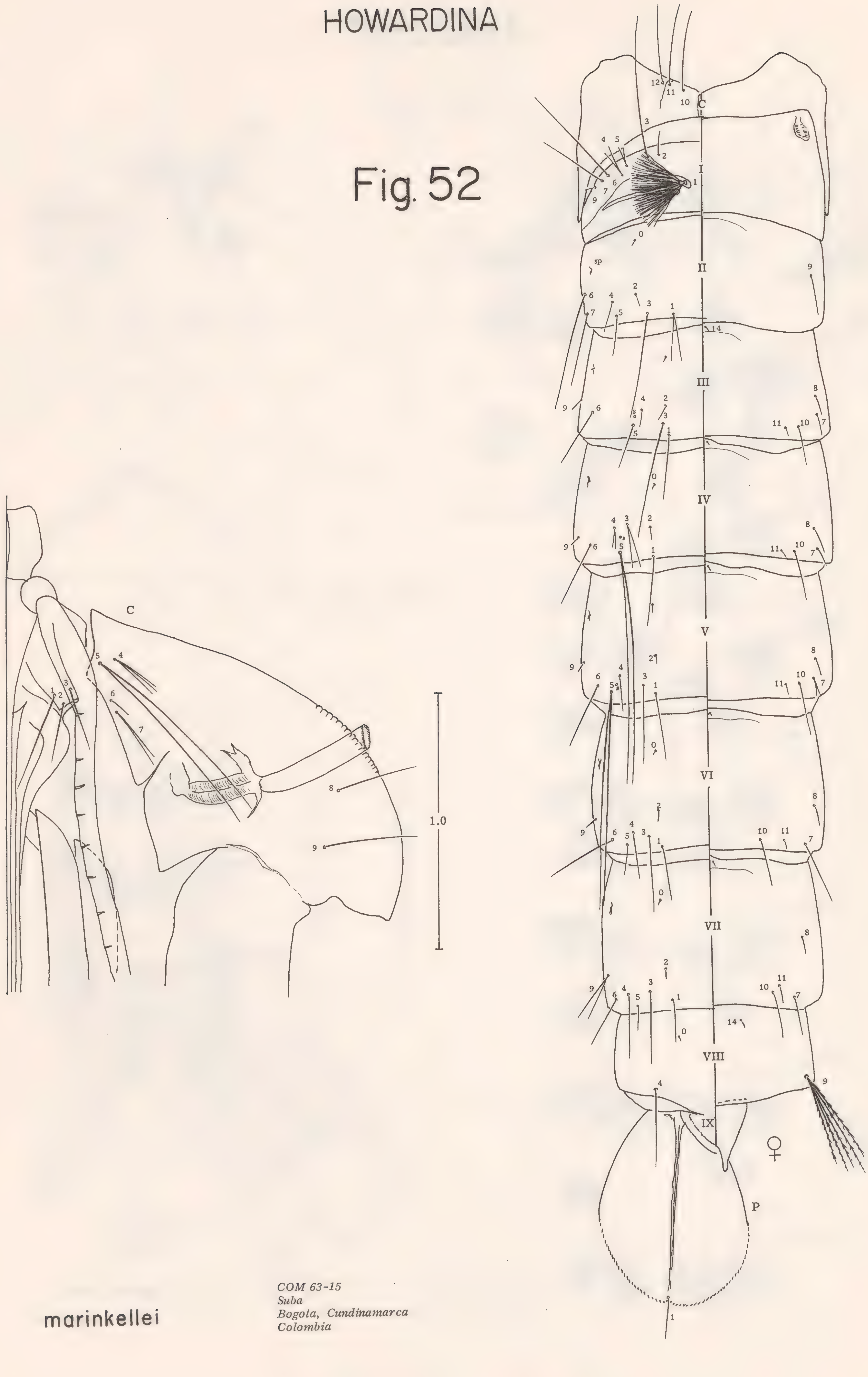


Fig. 51

COB 10-22
Buritica,
Antioquia
Colombia

eleanorae

Fig. 52



marinkellei

COM 63-15
Suba
Bogota, Cundinamarca
Colombia

HOWARDINA

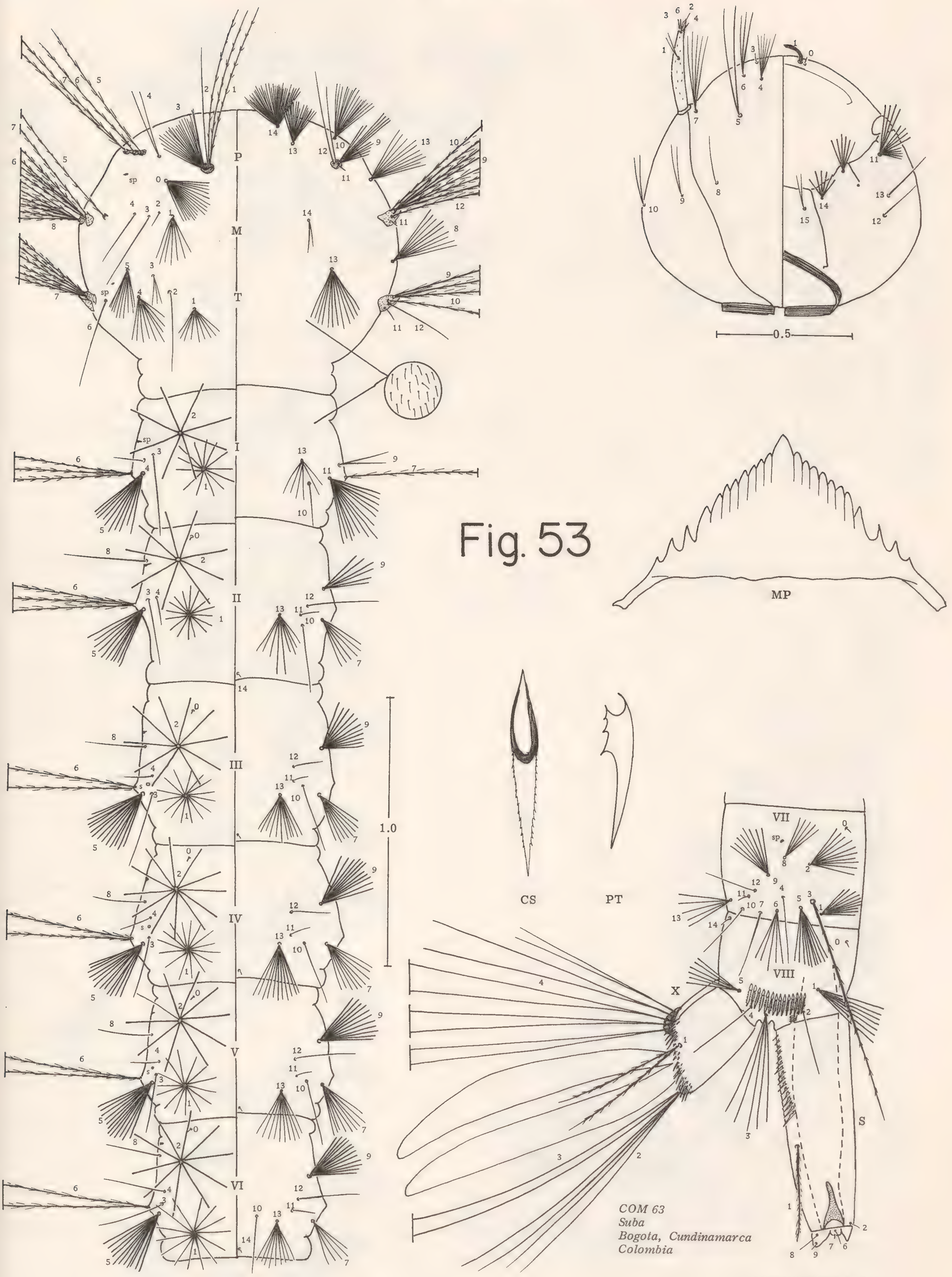


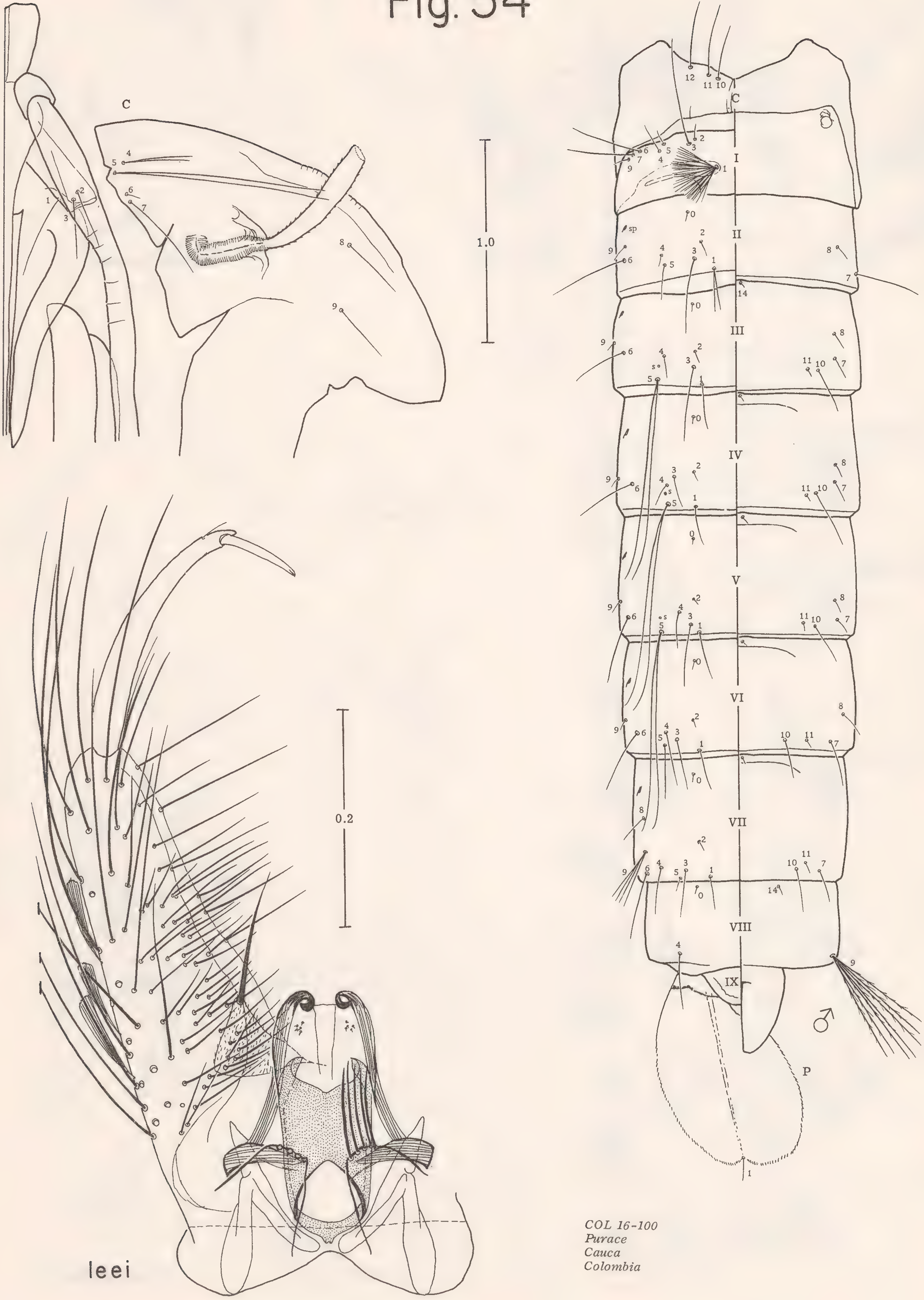
Fig. 53

COM 63
Suba
Bogota, Cundinamarca
Colombia

marinkellei

HOWARDINA

Fig. 54



leei

COL 16-100
Purace
Cauca
Colombia

HOWARDINA

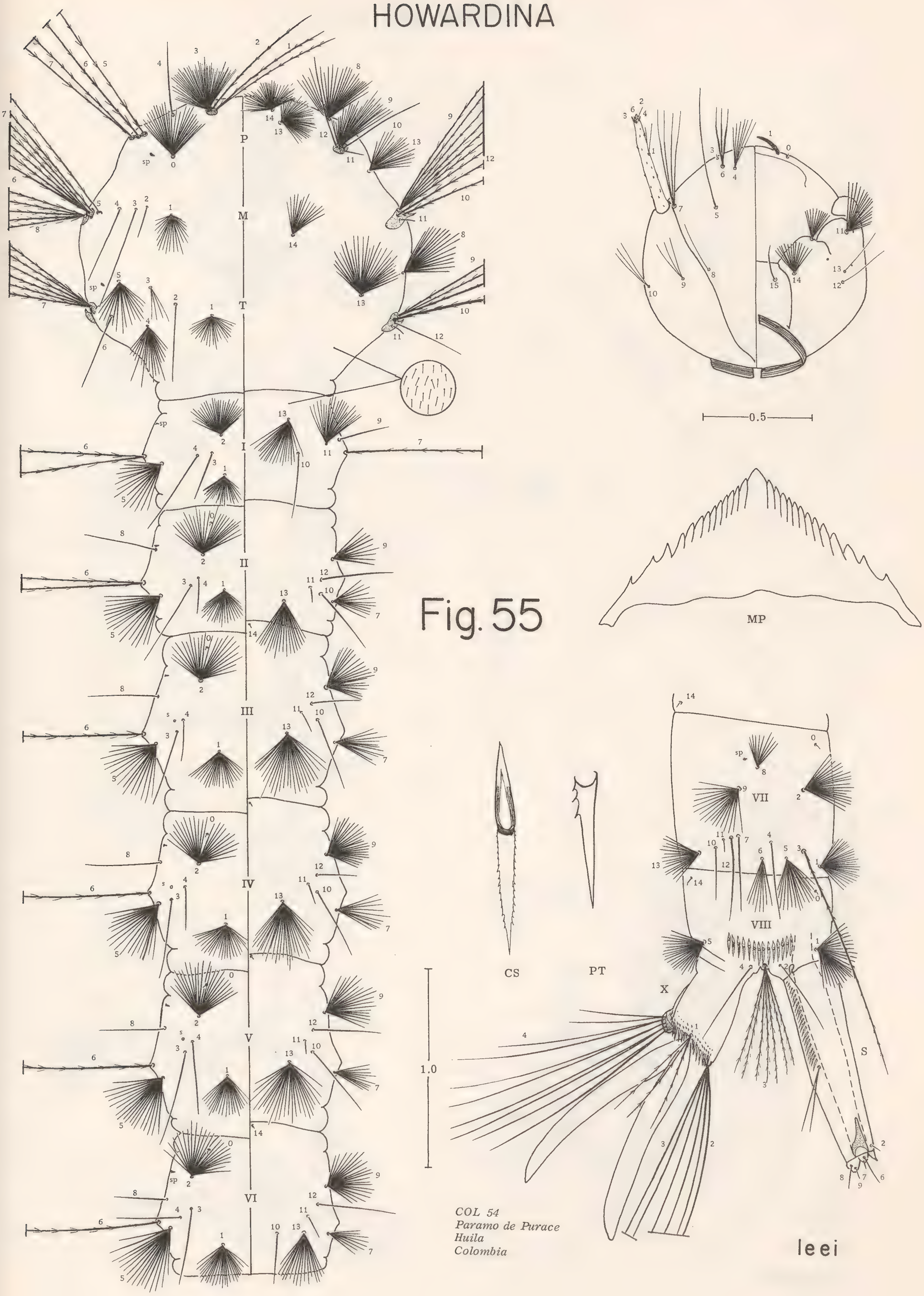


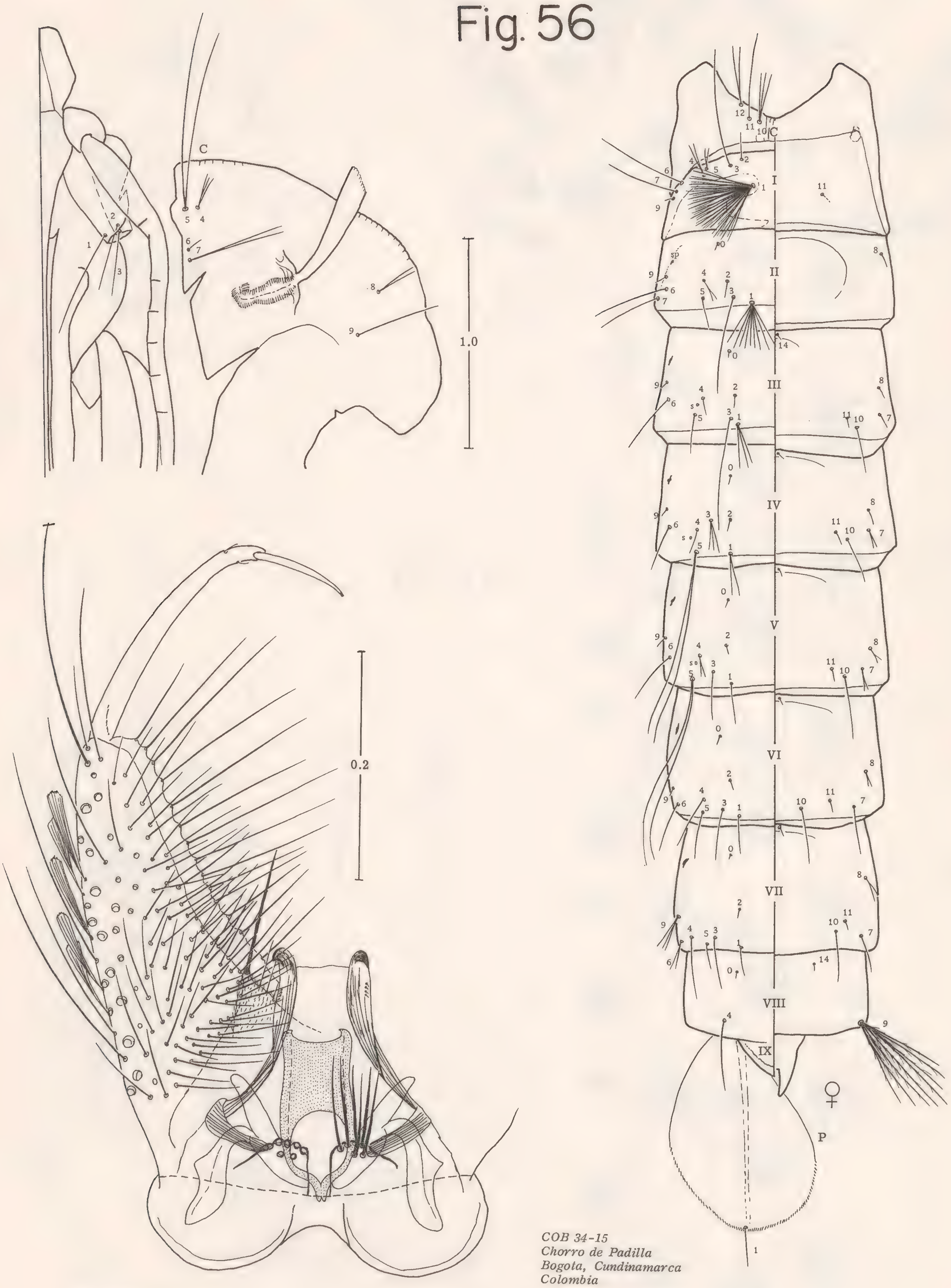
Fig. 55

COL 54
Paramo de Purace
Huila
Colombia

leei

HOWARDINA

Fig. 56



COB 34-15
Chorro de Padilla
Bogota, Cundinamarca
Colombia

osornoi

HOWARDINA

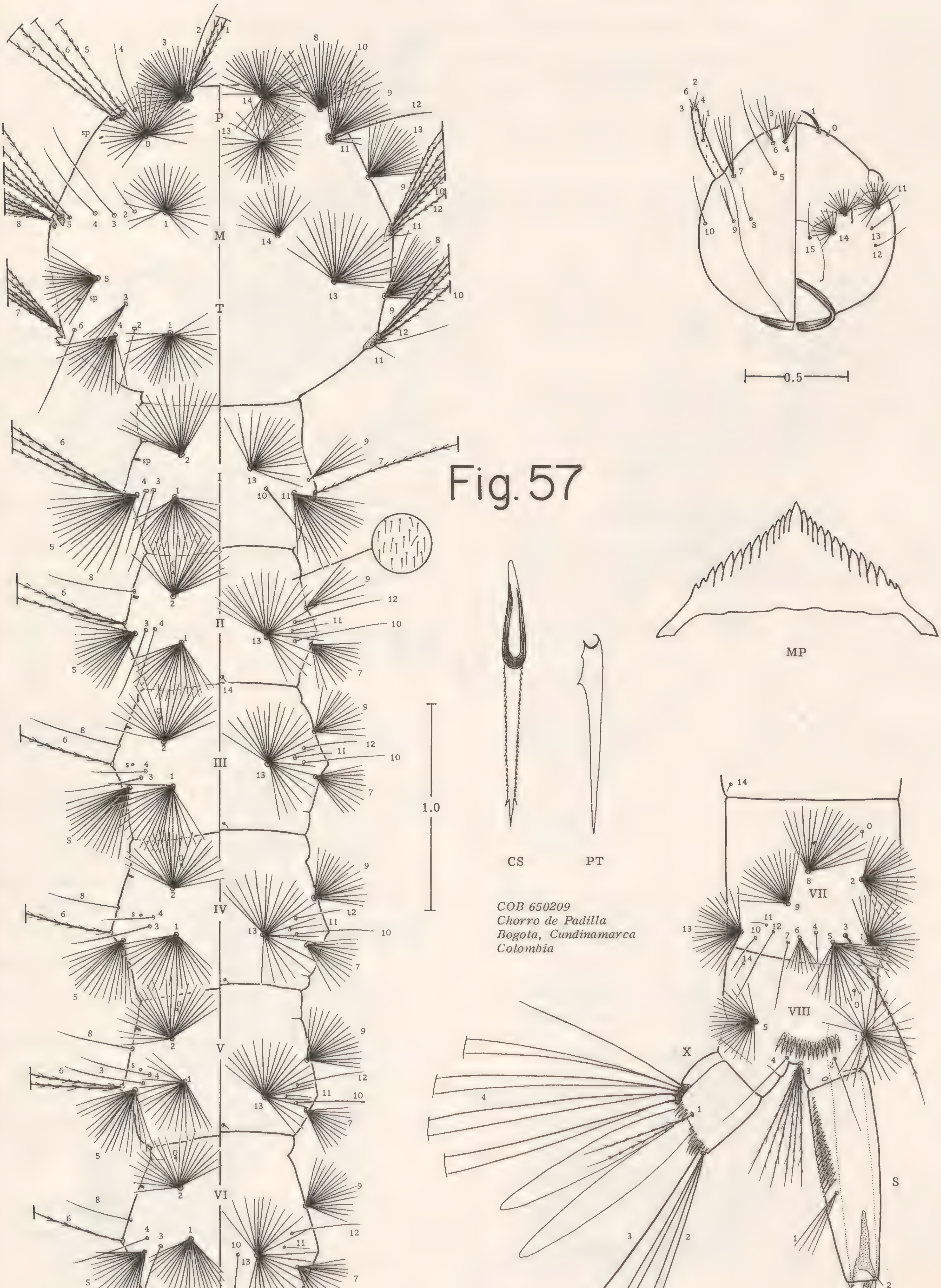


Fig. 57

COB 650209
Chorro de Padilla
Bogota, Cundinamarca
Colombia

osornoi

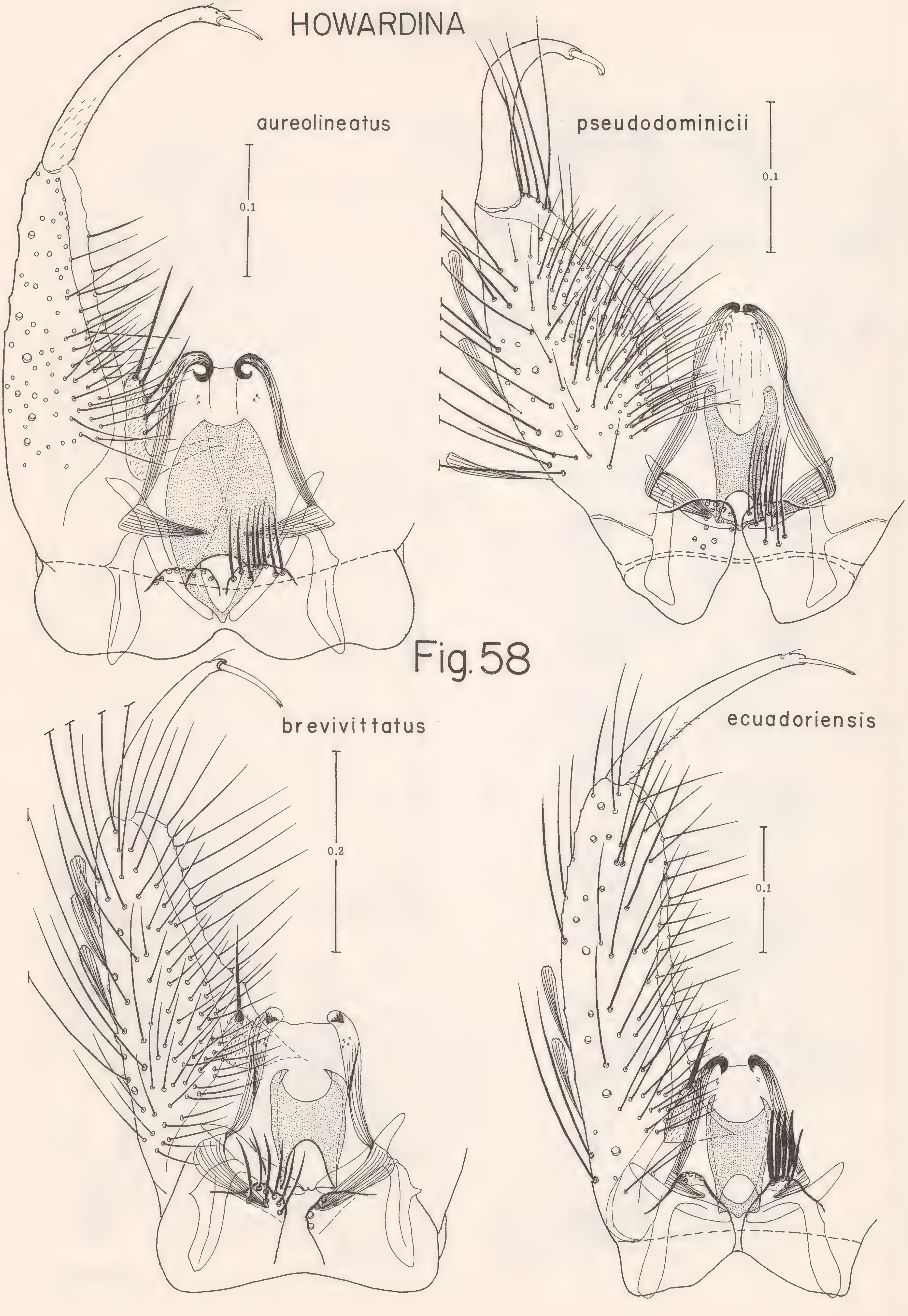

HOWARDINA
aureolineatus
0.1
pseudodominicii
0.1
brevivittatus
0.2
ecuadoriensis
0.1

Fig. 58

INDEX TO SCIENTIFIC NAMES

Names of valid taxa included in *Howardina* are in **boldface type**, names of valid extralimital taxa are in roman type. *Italic type* is used for names of all taxa considered invalid in this work (synonyms, homonyms, misidentifications, gross erroneous spellings, and so on). Misidentifications or invalid taxonomic interpretations are indicated by the use of the term "of authors" or "of" followed by a specific author, and are listed as separate entries following the entry for the correctly applied identical name.

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